The Engineering and Mining Journal

ISSUED WEEKLY

VOLUME XCIV

July 1 to December 31, 1912

Hill Publishing Co.
505 PEARL STREET
NEW YORK

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engmnjour, N. Y.

CIRCULATION STATEMENT

Of this issue 10,000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

Contents

Page

Editorials:
Pig Iron Production 1
Zinc Dust as a Precipitant 2
Modern Lead Smelting 2
Low Grade Iron Ore of Lake Superior 2
The Steel Corporation and Its Employees 3
Review of Porcupine 3
Chronology of Mining for June, 1912 .. 4
June Mining Dividends 4
Delay in Survey Field Work 4
Correspondence and Discussion:
As to Prospecting....Leasing at Cripple Creek....Lluvia de Oro Refining....The Ton 5
The Electric Smelting of Zinc Ore. W. R. Ingalls 7
Diamonds in German Southwest Africa 10
Details of Practical Mining:
*Steel Headframe at Negaunee Mine ....Some Improvements in Drill Sharpeners....*Skip Car for Flat Grades .... Automatic Mine Pump Control....*Safety Device for Cars on Inclines....Strength of Manila Rope....Sinking Placer Test Pits in Siberia....Heating Water....To Anneal Cast Iron....*A New Kutter Formula Diagram 11
Details of Metallurgical Practice:
*Cleaning Oily Waste .... *The Caldecott Sand Filter Table.... *Compressed Air Oil Lift 15
The Cost of Doing Things:
Esperanza Costs....Costs on Gogebic Range....Costs at the Bluebell Mine....U. S. Iron and Steel Works....Nundydroog Mines, India ....Machine Drilling in Alaska.... Zinc Mining Costs....Ahmeek Production Costs 17
Company Promotion in London. William Hillman 19
Australian Production in 1910 21
Stock Companies and Townsites on the Iron Ranges 22
Gold Mining in Formosa 22
Missouri Zinc Production in 1911 22
*Benoni Mine and Mill on the Rand. H. S. Gleser 23
Electrification of Butte, Anaconda & Pacific R.R. 26
*Mud Disposal in Blast Furnace Gas Purification ..... Alfred Gradenwitz 27
First Recorded Use of Mineral Coal in America ..... Charles R. Keyes 27
*Measuring Air Consumption. George H. Gilman 28
Yerington District, Nevada 29
Michigan Copper Mining Co 29
Mining Index 30
Personal, Obituary and Societies 34
Editorial Correspondence 35
Mining News 37
Markets 43
*Illustrated.

The Engineering and Mining Journal

Vol. 94. JULY 6, 1912. No. 1

Pig Iron Production

The production of pig iron in the United States has been increasing for several months past and in May it was at the rate of over 30,000,000 tons a year. Unless some unexpected condition arises, the make for 1912 will be the greatest in our history. This is equivalent to saying that the production of iron and steel for the year will be the largest ever reported. The great consumption of the metals which started up with the reduction of prices and the substitution of an open market for the attempt to maintain controlled prices has continued, and the country is absorbing steel at a rate which promises to continue for some time. The recent advances in price have not been sufficient to check this movement.

It is noticeable that the greatest increase in the production of pig has been at the steel furnaces; that is, at the furnaces which are owned or controlled by the large steel companies and which make iron chiefly or entirely for conversion into steel. The merchant furnaces, which are the chief makers of foundry and forge iron have been comparatively less active and the increase in the number in blast has not been so great. This would tend to show that the consumption of finished steel has increased much more rapidly than that of cast iron and foundry products and this conclusion is confirmed by other facts. At the present time the most active section of the foundry trade is in cast-iron pipe for which there has been an unprecedented demand, owing to the extraordinary increase in local water and gas plants in large and small cities.

Prices of pig iron on the market have remained at a moderate level and advances have not been large. These prices, as quoted in the markets, mainly refer really to foundry and forge iron. There is a nominal level for steel-making irons but this does not greatly affect the merchant furnaces, since so large a proportion of that kind of iron is made by the steel-company furnaces, and whatever their systems of bookkeeping may be the price to them is really the cost of operating.

Already we hear complaints of the scarcity of coke and the difficulty of obtaining sufficient supplies for the furnaces. This has been to some extent exaggerated and has served its purpose of advancing prices. Nevertheless, the supply of coke must necessarily put a limitation on the activity of the blast furnaces and that supply cannot be increased beyond a certain point at short notice. Another complaint made is of a shortage of labor and this applies both to the furnaces and to the coke ovens.

The unsold or unused stocks of pig iron, which were so heavy at the close of 1910, were in some degree eliminated in the course of 1911 and have been, during the five months of the present year, reduced closely to the normal level which it is necessary to carry at all times. The furnaces of Eastern Pennsylvania and of the Mahoning and Shenango Valleys, as well as the Lake district, have been pretty well cleaned out of surplus stocks.

Some still remain in Virginia and Alabama, but these are rapidly disappearing and after a month or two may be eliminated entirely from the market. It is a difficult matter to ascertain the exact amount of these stocks, but these statements are based upon the best opinions obtainable in the different districts. There is still some reserve of blast furnace capacity which is not active; but production at the rate we have named above would indicate that over 80% of our available furnaces must be at work. Quite a large proportion of the remainder are so placed that they cannot be expected to go into operation profitably except at a higher rate of prices than prevails at present. Some advances are now being asked to cover the advance in coke and the increase in wages which come furnaces have found necessary.

Zinc Dust as a Precipitant

The rapidity with which the zinc-dust process of precipitation in cyaniding is being adopted, especially in the new mills, makes any information on the subject of interest. Much of the progress in this branch has been in the line of improved apparatus for applying the zinc dust, as is shown by the many types of zinc-dust feeders that have been produced. The time seems to have arrived when greater attention should be given to the precipitant itself.

The method of buying fuel and other supplies by specification should find application in cyanide mills, and would be particularly advantageous in the purchasing of zinc dust. In the case of cyanide this method is virtually used, for the price is based on the percentage of potassium cyanide or equivalent present. With zinc dust it is not so easy, owing to the difficulty of stating the requirements. A lot of zinc dust might contain no metal impurity but still be low in precipitating power because of the form in which the zinc occurs. Further, the presence of a metallic impurity such as lead is generally of advantage. Obviously then the mere designation of "pure" zinc dust would not insure obtaining a good precipitant.

A consideration of the source of zinc dust is sufficient to show that its composition is subject to variations. While this general fact is known, the extent to which such changes affect the precipitating properties is not well understood. Since as high as 20% difference in precipitating efficiency is sometimes observed in practice, with two lots of zinc dust used under the same conditions, it is evident that the constitution of this form of precipitant is highly important. This also leads to the conjecture that zinc-dust precipitation in certain instances may have been condemned when the unsatisfactory results obtained were largely attributable to the poor quality of zinc dust used.

Of particular interest, therefore, are the investigations of W. J. Sharwood, the results of which were published in a recent issue of the JOURNAL. Some of the chemical and physical properties of zinc dust which affect its precipitating qualities were given, together with methods for making tests. By following the line of research indicated by Mr. Sharwood the cyanider should be well prepared to attack his particular precipitating problems. By determining whether the precipitant or the method of manipulation is responsible for the results obtained, the operator gains a distinct advantage in the control of this branch of the process.

Modern Lead Smelting

One of the metallurgical difficulties of former times was the treatment of lead-copper ores. The copper smelter was not keen about buying them, because he would lose the lead; and, while the lead smelter would take them and ultimately recover both metals, that was accomplished only by a long drawn-out process and by suffering a large loss of the metals, especially of the lead. Several years ago, however, the problem of converting lead-copper matte and collecting the lead fume by bag filtration was successfully worked out at the Omaha plant of the American Smelting & Refining Co., and also at the Perth Amboy plant of the same company, and we suppose that a similar procedure would now be followed in any new smelting works. In the conducting of a customs business, especially, it is nowadays rather essential to possess a combination plant, a copper smelter who is unable to receive lead-bearing ore being at a disadvantage. This was fully recognized by Mr. Mathewson in his designing of the Tooele plant of the International Smelting and Refining Co., and was undoubtedly one of the reasons leading that company into the lead business.

This company provided itself with adequate means for the treatment of lead-copper matte, which is no longer a bugbear. Such matte at Tooele is blown up without reconcentration, the lead being partly collected as fume from the filtering bags (of wool) and partly being scorified, entering the converter slag, which latter is of a sufficient tenor in lead to be returned to the lead-smelting furnaces. The Tooele plant is reported in other respects to be an exhibition of the most modern development of lead smelting practice. Dwight & Lloyd sinterers take the place of the old-fashioned roasting furnaces. The blast furnaces are large and of uptodate design. Fumes are filtered through bags. And, finally, as an innovation, the time-honored practice of bedding the furnace charges has been discarded in favor of an actual weighing out of each constituent. The last feature results in a perfection of mixture which is said greatly to promote the running of the blast furnaces which, of course, is in the line of what ought to be expected.

Low Grade Iron Ores of Lake Superior

An event of more than local interest occurred recently when the Wisconsin Steel Co. placed in operation its iron-ore washery at Nashwauk, on the Mesabi Range in Minnesota. This is the second installation of its kind on that range, the Coleraine plant of the Oliver Iron Mining Co., having been in operation for several years. Although of commercial size, the installation at Coleraine was avowedly an experiment. In view of the construction of the Nashwauk plant, along the same lines, after a lapse of a few years, it is logical to suppose that the process has been found successful.

On this supposition, the direct meaning is, that another process has been added to the list of those having for their purpose the successful treatment of various kinds of low-grade iron ores. Experiments along these lines are keenly watched in the Lake Superior region, as their success means much to the district as a whole. It is well understood, of course, that the known deposits of low-grade iron ore on the Lake Superior ranges that are at present unmarketable in their natural condition, are enormous. It is not to be expected, either, that any one process will ever be successful in making all of these low-grade ores available.

These ores can, however, be classified into several groups, having common characteristics, and the problem of finding processes to meet the necessities of the several groups seems to be meeting with some success, as in the Coleraine and Nashwauk plants. The Jones step process, which has been undergoing experimentation at several Michigan points for some time, was designed primarily to handle ores widely different from those that the two plants mentioned above are treating. At the Moose Mt. Ltd., in Ontario, the American Gröndal process is being installed. The latter, of course, is in successful operation in other places. The Lake Superior ranges offer a rich field for work of this kind and it is clearly evident that the experimenters are aware of this.

The Steel Corporation and Its Employee

The report of the committee appointed to consider conditions among the employees of the Steel Corporation has been sent out to stockholders, accompanied by a letter from Chairman E. H. Gary, summing up its chief points. The report covers four subjects enumerated as follows by the committee: (*a*) The seven-day week and long turn. (*b*) The eleven-hour day. (*c*) The speeding of the workmen. (*d*) The repression of the men. Briefly stated, the findings of the committee upon these four subjects are as follows:

Seven-Day Week and Long Turn.

1. With respect to the seven-day week and long turn the committee says: The records of today indicate that with the exception of two or three plants the seven-day week has been relegated to the past. The committee adds that this should be absolutely enforced at all times in all mines, shops, railroads, docks and works of the Steel Corporation.

The Finance Committee recommended the elimination of seven-day labor as early as 1907, and the stockholders' committee reports that this recommendation is being observed; but to leave no room for doubt, the Finance Committee has now adopted the following resolutions:

"Resolved, That in accordance with the spirit of the resolution adopted by this committee on April 23, 1907, seven-day labor should be eliminated in all mines, mills, shops, railways, docks and works of the Steel Corporation, except under special circumstances and then only upon the consent of this committee.

"Resolved, That the so called long turn, formerly followed in the change of shifts in continuous-process work, shall be eliminated or reduced in all cases where it now continues among employees of the subsidiary companies, except under special circumstances and then only upon the consent of this committee.

"Resolved, That conscientious effort should be made by all to reduce to a minimum any unusual length in work hours that emergencies and unforseen conditions may sometimes demand.

"Resolved, That copies of these resolutions be sent to the presidents of all the subsidiary companies with the recommendation that all operating officials be governed accordingly."

Twelve-Hour Day, Open Shop and "Speeding"

2. With respect to the 12-hr. day, the stockholders' committee says that steps should be taken now that shall have for their purpose and end a reasonable and just arrangement to all concerned of the problems involved in this question—that of reducing the long hours of labor—we would respectfuly recommend to the intelligent and thoughtful consideration of the proper officers of the corporation.

In response to this recommendation, the Finance Committee has passed the following resolution:

"Resolved, That the chairman, Mr. Roberts, and the president of the corporation be appointed a committee to consider what, if any, arrangement with a view to reducing the 12-hr. day, in so far as it now exist among the employees of the subsidiary companies, is reasonable, just and practicable.

"3. With respect to the alleged 'speeding of the workmen,' the stockholders' committee says: Our observation of labor conditions in the mills of the Steel Corporation does not lead us to believe that there is either desire or tendency on the part of the foremen and superintendents to pursue these policies to a point that would mean harm or injury to the men under their charge.

"4. With respect to the so-called 'repression of the men,' the stockholders' committee find that the Steel Corporation, in view of the practices often pursued by labor organizations in steel mills in past years, is justified in the position it has taken. That position is an adherence to the principle of the open shop which permits any workman to labor whether he is a member of a union or not."

Large Outlays

The report of the stockholders' committee contains a summary of certain plans which the Corporation has put in force for the benefit of its workmen, namely, accident prevention, accident relief, pensions, sanitation and welfare and employees' stock subscription. It is proper that the stockholders should know what is being spent annually for thus bettering the conditions of the workmen. This aggregate annual expenditure, which would otherwise be available for dividends, is as follows: Relief for men injured and the families of men killed, which is paid in all cases regardless of legal liability, costs each year, approximately $2,000,000; accident prevention, probably the most effective system in the United States, costs each year, approximately $750,000; sanitation and welfare work of all sorts, now developing, costs already each year, approximately $1,250,000; the pension fund, which provides support for superannuated employees, requiring each year: (*a*) for pension payments, approximately $200,000; (*b*) for the creation of a permanent fund to be completed in 13 years, $500,000; the employees' stock subscription plan costs each year, approximately, $750,000; total annual expenditures for improving the conditions of workmen, approximately $5,450,000.

Wages have not been reduced, but on the contrary have been increased nearly 25% since the Corporation was organized; and the workmen have not been required to contribute in any way to the expenditures for their benefit.

Report To Stockholders

In conclusion, the stockholders' committee recommends that hereafter and at stated periods correct and reliable first hand information as to these matters and the advancement and betterments being effected be furnished to all stockholders. This recommenation is under consideration by the Finance Committee, which has directed a plan to be prepared and reported to it.

Review of Porcupine

Special Correspondence

Holders of Porcupine securities appear to have given up hope of there being a boom in stocks, and are basing their hopes on the expectation of a revival of interest in properties. There seems to be some basis of fact for this, and despite the general business depression, the outlook for the working properties has never been so bright. The period of depression has not been an unmixed evil, as it has resulted in eliminating the great majority of the wildcats which flourished so extensively about a year ago. It has also had a decided effect on the price of mining properties, and owners are now generally willing to give a free option for a sufficient length of time to enable the prospective purchaser to determine the value of the tract. Unfortunately, however, the properties available for purchase which are worthy of consideration, are few and far between.

Three Sections in District.

The Porcupine district can roughly be divided into three sections, the Pearl Lake, Dome and North Whitney. Of these the first two are much the most important. The last embraces the Crown Chartered, Scottish-Ontario, Hughes and several other properties. None of these is as yet beyond the prospect stage.

In the Dome section the only properties working are the Dome, Dome Lake, North Dome and Dome Extension, and these are mentioned in the order of importance. The Dome is now working to full capacity and is treating approximately 10,000 tons per month. Development work on the 100-ft. level is being vigorously prosecuted, and the incline between the 45- and 100-ft. levels will be in operation in a few months. The headframe over No. 2 shaft is under construction and when completed the shaft will be sunk to the 400-ft. level and the ground to the east opened. About 250 men are employed. The other three properties in this section are in the prospect stage. The Dome Lake, while small, shows considerable

promise, and good ore has recently been opened on the 100-ft. level. The company is considering the erection of a 10-stamp mill, and while plans for it have been drawn, the work of construction has not been started. The North Dome is doing work and some good ore has recently been encountered on the 50-ft. level. The grade of the ore, however, is believed to be erratic. The Dome Extension's hopes seem to be largely based on the possibility of getting the extension of the Dome orebody. Ore has been opened in one of the shafts but the grade is low, and the company has not yet succeeded in finding the Dome orebody in its own workings, although diamond drilling has given them some encouragement.

PEARL LAKE SECTION.

In point of richness and the number of promising properties, the Pearl Lake section is undoubtedly the best in the district. This embraces the Hollinger, Vipond, McIntyre, Jupiter, McEnaney, Plenaurum, Miller-Middeton and Dixon. The last two are owned by the Hollinger interests and may eventually be consolidated with that property. The Hollinger has a 40-ft. stamp mill in operation, and is doing a large amount of underground development. This work has increased the reserves to some extent and has borne out the possibilities of the property as given in Mr. Robbins' report. Sinking below the 200-ft. level will be carried on from four points.

The McIntyre has had a 10-stamp mill in operation for some months, and has succeeded in opening some good ore underground. It is probable, however, that the mill was started before the mine was ready for it, and operations have been hampered by lack of sufficient development work on the orebodies.

The Vipond mill has recently been started and while as yet it is too early to make predictions, the results to date are stated to be satisfactory. The mill is using rolls and ball mills instead of stamps, and the process consists of amalgamation and concentration. A considerable tonnage has been developed on the 100- and 200-ft. levels, the average stoping width being about 6 ft. Work is now being carried on at the 300-ft. level. The Jupiter appears to be a property of considerable promise and has developed pay ore down to 300 ft., the lowest working at present. The property is controlled by the Drummonds, of Montreal. Recent developments on the McEnaney, owned by the Crown Reserve, have also been encouraging, and an orebody has been opened on the 300- ft. level. The Plenaurum has also been showing up well under development.

The two large mines of the Porcupine district are of course the Dome and the Hollinger and these two alone would be sufficient to confer distinction upon the camp. The mills at present in operation will treat approximately 800 tons per day, and there is reason to believe that a number of small mills will be built in the near future.

June Mining Dividends

United States mining dividends for June show a total of $5,645,993, a sum which is over half due to three copper companies, Calumet & Hecla, Utah Copper and Nevada Consolidated. The last two have paid only their usual dividends, while Calumet & Hecla, under influence of the rising copper market, has moved its dividend up to $10 quarterly. Quincy has also increased its dividend, while Superior & Pittsburg, and Calumet & Arizona still continue their old rates, being apparently deterred from too great disbursements by the thought of the large construction expenditures necessary in the near future. These six companies alone paid a total of $4,164,851.

United States Mining Companies	Situation	Per Share	Total
Bing-New Naven, c	Utah..	$0.10	22,869
Bunker Hill Con., g	Calif..	0.07½	15,000
Bunker Hill & Sull., l. s	Ida...	0.20	65,400
Calumet & Ariz., c	Ariz...	1.00	596,353
Calumet & Hecla, c	Mich..	10.00	1,000,000
Colorado, l. s. g	Utah..	0.03	30,000
Doe Run, l	Mo...	1.50	98,673
El Paso, g	Colo..	0.01	24,500
Federal M. & S., l. s	Ida...	1.50	180,000
Fremont, g	Calif..	0.02	4,000
Frontier, s	Wis....	2.00	2,500
Gold Dollar, g	Colo..	0.00½	12,500
Golden Cycle, g	Colo..	0.02	30,000
Hecla, l. s	Ida...	0.02	20,000
Homestake, g	S. D..	0.50	109,200
Hazel, g	Calif...	0.01	9,000
Montana-Tonapoh, g. s	Nev....	0.10	100,000
New Idria, q	Calif...	0.30	30,000
Nevada Con, c	Nev....	0.37½	749,773
North Star, g	Calif...	0.30	75,000
Qiuncy, c	Mich..	1.25	187,500
St. Joseph, l	Mo...	0.15	150,000
Superior & Pitts, c	Ariz....	0.30	449,938
United Verde, c	Ariz....	0.75	225,000
Utah Copper, c	Utah,.	0.75	1,181,287
Yukon Gold, g	Yukon	0.07½	262,500
Wasp No. 2, g	S. D..	0.03	15,000

Coal, Iron, Industiral and Holding Companies	Situation	Per Share	Total
Am. Sm. & Ref., com	U. S..	1.00	500,000
Am. Sm. & Ref., pfd	Mex..	1.75	875,000
Crucible Steel	U. S..	1.75	427,638
General Asphalt pfd	U. S..	1.25	164,120
Gen. Chem., com	U. S..	1.50	122,269
Harbison-Walker	Penn..	0.50	90,000
Inter. Nickel, com	U. S..	7.00	810,784
Inter. Sm. & Ref	U. S..	2.00	200,000
Nat'l Lead, com	U. S..	0.75	154,914
Nat'l Lead, pfd	U. S...	1.75	426,433
Phelps Dodge	U. S... Mex..	4.50	2,025,000
Texas & Pacific Coal	Tex..	1.50	37,500
U. S. Steel, com	U. S..	1.25	6,353,781

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Crown Reserve, s	Ont..	0.10	100,000
Esperanza, s. g	Mex..	0.36	165,847
Hedley, g	B. C..	0.50	60,000
Kerr Lake, s	Ont...	0.25	150,000
Tem. & Hud. Bay, s	Ont...	3.00	23,283
Tretheway, s	Ont...	0.10	100,000

What is also equivalent to a copper dividend is that of Phelps Dodge & Co., which has made its regular 2½% quarterly payment plus an extra dividend of 2%, a total of $2,025,000. This is, however, classed with our metallurgical and holding companies, whose payments reach the sum of $12,187,439, of which sum $6,353,781 is due to the 1¼% quarterly disbursement on Steel common. Dividends reported to the JOURNAL by Mexican and Canadian companies amount to only $599,130 for the month. The Mexican troubles still are affecting the companies to the South. Esperanza has gone on a basis of 7½% semi-annually.

Federal has done what has been expected for some time and has reduced its preferred dividend to 1½% quarterly. The stock is a 7% cumulative issue. The common has not paid since January, 1909.

Mining dividends declared by United States companies making public reports amount to $27,693,598 for the half year ended June 30, 1912, and those of mining, metallurgical and allied companies amount to $84,736,670.

Chronology of Mining for June, 1912

June 1—United States Smelting, Refining & Mining Co. secured control of the Consolidated Fuel Co.'s lands in Utah, comprising about 5000 acres.—Trial run on Giroux Consolidated ore started at Steptoe concentrator.

June 2—A 7000-bbl. gusher of the Pacific Crude Oil Co., in California caught fire and burned six days before extinguished.—Announcement of formation of the Canadian Mining & Exploration Co., Ltd., with a capital of $5,000,000, divided into shares of $5000 par value.

June 5-6—Fighting occurred between revolutionists and the employees at the property of the Cuba Copper Co. near Santiago de Cuba.

June 10—Operators in the Globe-Miami district, Arizona, granted concessions to employees, embodying increase in wages or reduction of working hours.

June 13—The Interstate Commerce Commission ruled that interstate pipe lines are common carriers and subject to the provisions of the Interstate Commerce Law.—The United States Court at Wilmington, Del., issued a final decree ordering the dissolution of the so called powder trust and a division of the business among three companies.—Announcement of the awarding of $400,000 damages to the Smuggler-Union company, in Colorado, in its suit against the Liberty Bell mine for trespass.

June 15—The Hollinger mill at Porcupine started operation.

June 18—Settlement of the strike at the refinery of the American Smelting & Refining Co., at Perth Amboy, N. J.

June 19—An explosion in the Hastings mine of the Victor-American Fuel Co., in Colorado, killed 12 men and injured one.

The Van Ryn Gold Mines Estate, Ltd., has declared a dividend of 22½%, payable to stockholders of June 30, 1912. This makes a total of 45% for the year.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

As to Prospecting

I wish to make a few remarks, relative to Mr. Ropes' criticism (ENG. AND MIN. JOURN., June 1, 1912), of my article. I am glad to have awakened one man, who has held a government position.

There is no object in quoting the statutes, so long as each political incumbent of the Land Office construes them as he pleases. One has only to review the ruling of the department for a number of years in order to verify this. Notwithstanding that there may be nothing in the law and rulings of the Land Office to drive the prospector from the Forest Reserves, it is true that the arbitrary action of the ranges, in many cases, has done it, until there is a general disposition and belief that there is no use trying to prospect on the Reserves. The conditions are somewhat similar to the attorney and his client who was in jail; the former insisted that the law could not place the latter there.

I would also ask Mr. Ropes, how much time generally intervenes, with the red tape of the office, from the filing of the charges by the ranger, until final dismissal by the Land Office? It would appear that the poor prospector's "mental anguish" may be prolonged several months, at least.

On the other hand, what is the use and public benefit of these reserves, in this arid-basin country, where there is scarcely a stick of timber fit for a stull in a mine, except in some deep, inaccessible cañon? The general impression is that it only affords fat jobs to the reserve employees, who can keep the poor prospector from cutting old, dead piñon trees for fuel, and also collect 50c. per cord from every poor man for his firewood. The main object seems to be to make more political offices and patronage.

Three-fourths of the mines in Cripple Creek could not be patented today; but how has the general public been injured by what was possibly a liberal construction of the mining laws? The same conditions apply at Leadville. Each has produced its hundreds of millions, to the general welfare of the country. Nor were these mines obtained, in the first place, by large corporations. Many a poor man made a stake from his locations in Cripple Creek. Stratton had been a prospector for 20 years, prior to his location of the Independence.

I believe that the apex law should be abandoned. It has caused the greatest part of all mining litigation, and the poor man usually loses out. If one has a rich mine, advantage is taken of it to commence litigation, if only to force a compromise. It is not fair to others, as Mr. Ropes suggests, that the original discoverer should have time (often months or years) to determine the dip of his vein, reserving in the meantime two or three claims wide from location by someone else.

From several years' experience with mining laws of Mexico, in various parts, I know that the law in which vertical planes govern gives general satisfaction. In the first instance, one can locate his claim with the vein at the extreme edge, if he desired.

Again, no one is permitted even to locate a claim, overlying another only to his side line. If he finds from development that his vein is dipping out of his side line, he is or should be the first to know it. Except in proved or congested areas, the ground adjoining generally remains open. Until the recent revolutions, there were far more Americans prospecting in Mexico than in the United States. If we would do away with the apex law, and allow no claim to be located on another, it would do away with nine-tenths of mine litigation, and materially expedite the development of many mines and districts. Generally, nowadays, the mining man dare not open up his mine until he gets a patent, and unless he has bonanza ore on the surface, it is hard to get one.

It would not be fair to the poor man to compel him to patent his claim in a certain short time (or any limited time) or lose his property. It is often the case that the poor man in doing his annual assessment work has found pay ore, and has been able to develop his mine. Make the laws so that this $100 worth of work must be done, not skimped; or the mine relocated by interested parties.

We freely agree with Mr. Ropes that interest in the prospect (which means more encouragement to the prospector) must be revived, or mining will die a natural death; but for the causes of its decline, we think that the Government's action, from the Secretary of the Interior to the ranger on the Reserves, has had more to do with it than any or all other reasons.

G. L. SHELDON.

Ely, Nev., June 7, 1912.

Leasing at Cripple Creek

In the JOURNAL of May 11, 1912, the Denver correspondent says of the Cripple Creek district: "It is said that many of the large companies are leasing their best orebodies at high royalties, as they have found their profits are greater by this method than if worked on company account. Of course, the leaser works more economically and is more careful of the ore than the day's-pay miner, and moreover pays no salaries or office rent."

This impression seems to be gaining ground among mining men who are not in actual touch with the leasing system and who are influenced largely by local papers which boost the leasing business and sometimes greatly exaggerate the profits to the company from its leasers.

A little information in reference to the leasing system as operated by most of the mines in the Cripple Creek district may not come amiss to the mining public, so I will endeavor to throw some light upon a subject that has been sadly neglected by technical publications.

Mines doing a leasing business may be divided into the following classes: (1) Virgin or slightly developed property; (2) mines partially developed or nearly worked out and leased to large companies; (3) mines operated by the owning corporation and leased in small blocks.

Class (1) includes all property lying idle through lack of funds or otherwise, upon which little development work has been done. This character of ground is usually leased in large blocks for periods of time ranging from two to five years and at low royalties varying from 10 to 20%, as the location of the ground justifies. The leasers are required to furnish their own hoists, compressors and other equipment, if the same is not already upon the property, and in case they should be fortunate enough to discover ore in paying quantities must erect their own ore houses, etc., all of which equipment, with the exception of the machinery, must remain on the property at the expiration of the lease. Leasers of this character are a great benefit to the district at large and the leased property in particular, as such operations require considerable money to push them through to completion and in many cases productive mines are the result.

Class (2). It often happens that mines which have been partially developed, worked out or closed down on account of

poor management are leased to a large company, which takes the property under royalties varying from 15 to 25% of the net mill or smeltery returns and for a period of from two to five years.

In case any ore is exposed this ground is reserved for the leasing concern and the remainder of the property opened for sublease. The terms and conditions under which the subleasers operate vary considerably, the leaser sometimes offering to furnish hoisting, powder, machines, air and all other supplies in consideration of 50% of the returns of the ore so mined, after treatment and royalty charges have been deducted; sometimes charging the subleaser for these services and supplies, and adding 5 to 10% to the royalty for their profit.

In the former case the company secures more development than in the latter as the subleaser, if he is unsuccessful in his search, loses nothing but his labor, while under the latter system he loses both labor and expenses for hoisting, etc. On the other hand, the returns to the company are larger, and to the subleaser smaller, if the first system is followed and the ore is encountered.

Old nearly worked-out mines operated in this way often make good profits, and occasionally open new ore of considerable value, but rarely reach the productiveness of the mines as worked under company management. Of course, this is largely due to the fact that the better orebodies have been worked out, but still the fact remains that larger returns could be made if the owning company should work the property in the same manner.

Class (3). Many of the larger mines have, after extracting the major part of the ore, leased all or part of their territory out in blocks. Royalties are usually graded from 10 to 15% on low-grade ore (under $10 per ton) to 50% on ore over $100 per ton, while some companies charge a flat royalty of 33% and add excess royalties if the lease nets more than wages to the leaser.

As the average leaser cannot be depended upon for any large amount of development work the company must either do this work or hold out inducements to the leaser to do it, such as free hoisting, etc., or carrying him for these items until ore is opened.

That the operating costs of a large plant are not entirely met by the leasers at the rates usually charged is shown by the report of one company for 1911, which states that the company contributed 37% of the total operating cost of the surface plant, thus cutting down funds received from royalties to such an extent that the mine earned only about 6% of the gross value of the ore shipped. In this connection it must be borne in mind that during the year the company was doing no work on its own account and that the capital was being exhausted at the rate of about $250,000 per year to gain this small profit.

It is admitted that for some classes of mining the leasers will make a larger saving than by direct company work, but this only applies to small, narrow, or spotted oreshoots and old mines which have been practically worked out by the company. Large amounts of broken rock are often left in the workings, track and pipe line shot, and timbering left in bad condition by irresponsible leasers, and this must be cleaned out and put in shape at considerable cost to the company.

Where the owners have good bodies of ore they are rarely ever leased even on high royalties, unless the workings are dangerous or the work difficult of supervision, as the owner in a sense loses control of the property, and high-grading, poor timbering and slovenly work of all kinds usually result.

E. A. COLBURN, JR.

Victor, Colo., June 3, 1912.

Lluvia de Oro Refining

I am much interested in Mr. Conklin's article on refining bullion at the Lluvia de Oro mine, but think there is room for improvement in some of the work. Noting his question as to lining the furnace, why does not he try magnesite brick? The first cost is high, but the repair charges are correspondingly low. Some people are laying these bricks in a mixture of linseed oil and ground magnesite, but I believe a better mixture is found in a mush of ground magnesite and 20% sodium-silicate solution. A magnesite lining must be kept dry after it is put in use, but alternate wetting and heating furnishes a good way of "rotting out" an old lining, when one wishes to take it out. In case it is desired to put magnesite bricks and silica bricks in the same lining, put in a course of chrome brick between them. The ordinary magnesite brick will expand more on heating than the acid or neutral bricks. About ¼ in. per ft. should be allowed. I am sure the magnesite brick will be found superior to any sort of rammed lining, and probably better than firebrick.

MAGNESITE AS A NEUTRALIZER

Here is a little chemical suggestion for Mr. Conklin. If he ever adopts magnesite brick and tries it out, will he please advise the readers of the JOURNAL. In time, with a magnesite lining, he will certainly acquire some old cobbing from his furnace. By feeding this cobbing into his ball mills, will he not do away with any necessity of adding lime in the cyanide process? The only objection I can see to this is the possibility that the magnesite will not all go into solution, and will concentrate out with the present ore concentrates. Those concentrates will be unhappy things to smelt in that case. In that event, the magnesite cobbing would probably have to be treated with the iron slags from the concentrate smelting.

AIR PIPES IN REFINING FURNACES

The compressed-air jet in the refining operation strikes me as worth further trial. The copper and silver refiners could not keep house without it. It may be that the iron pipes burn off too rapidly in his charge.

This could possibly be alleviated by turning in a little jet of steam with the compressed air. In this case a bleeder valve must be placed in the steam line just before it unites with the air, and the steam should be run in just before the furnace. The reason for this statement can be seen when one considers the probable effect of shooting a chunk of water down into the molten bath. It might even be possible, with the small furnace at Lluvia de Oro, to use steam only as the converting agent. Theoretically it is possible, but the reaction would require a large amount of heat.

It may be found that with the use of a little steam in the air the simplest way is just to hitch the iron pipe on a rubber hose and jab the pipe down into the bath. If the pipes are threaded and pipe connections used, the old pieces can always be screwed onto a new one, and used up completely. The only variation on this I can suggest, if the consumption of iron pipe is too costly, is to follow the Japanese method, and simply blow a jet of air down into the bullion without the pipes ever being actually introduced into it. At this point I am reminded that advice is delightfully easy to give, when one is not up against the operating problem of taking it.

F. M. S.

Chicago, Ill., June 17, 1912.

The Ton

I should be pleased to have any reasonable explanation given as to the adoption of the long ton by the U. S. Geological Survey. I can remember when the long ton was mentioned in American publications only as an interesting survival of barbarism, like £, s., d., and the Beefeaters. Indeed, there were some optimists who hoped we ourselves would sometime emerge into the full light of the metric system. Now I note the Survey always specifies "short" tons, if 2000 lb. is meant, while lead, copper or coal, is as likely as not to be given us in 2240-lb. tons. Why? Is this a result of the "hands-across-the-sea" movement, and will the Survey shortly inflict cwt. of 112 lb. upon us, and "stones," and quintals of no one knows what weight?

AMERICAN.

Chicago, Ill., June 7, 1912.

The Electric Smelting of Zinc Ore

By W. R. Ingalls

A summary of the present state of this art, with a recital of analogies to and differences from the ordinary method of smelting, a discussion of the blue-powder condensation in electric smelting and the indication that this is a chief obstacle.

Note—A paper read at the meeting of the Canadian Mining Institute, at Toronto. Mar. 8, 1912.

The electric smelting of zinc ore during recent years has engaged much attention. It is not a new idea. The Cowles brothers tried it in 1885, which was the first attempt (so far as I am aware), and since then numerous experimenters have undertaken it. It is not my intention in this paper to trace their work, or go further into the history of the subject. It is sufficient for my present purpose to mention that C. P. G. De Laval was the first to erect an electric zinc-smelting furnace on a commercial scale, this having been done in Scandinavia in 1901. Works were later erected at Sarpsborg, in Norway, and at Trollhättan, in Sweden. I do not know precisely the dates of their erection, but they were in operation as early as 1905. It was attempted at first to smelt ore, but for a long time this was not commercially successful, the product being chiefly zinc powder, which had to be subjected to resmelting, giving an impure spelter, which had to be refined. The works were continued in operation in a more or less irregular way and spelter from them came on the market, but this was the product of smelting dross, scrap and other secondary products rather than ore. Some progress in ore smelting was made, however, and during 1911 a considerable quantity of ore was smelted by a method, to which I shall refer subsequently.

There is much misconception respecting both the ordinary art of zinc smelting, and the possibilities of electric smelting. In the first place, the ordinary art of zinc smelting is not extraordinarily backward, in spite of the small retorts to which we are limited; and although we are attracted by the possibility of conducting the distillation in a relatively large apparatus, electrically heated, I am not yet by any means prepared to say that electric smelting will offer any advantage over existing methods, even if the difficulties that are now in view can be overcome. In the second place, electric smelting is not to be expected to accomplish the establishment of any radically new metallurgical principle. If there be any dreams of an electric furnace analogous to the blast furnace, in which run-of-mine ore may be charged roughly and from which spelter, lead and perhaps also copper matte, may be obtained concurrently, I fear that there will be no realization of them.

Carbon Reduction and Iron Decomposition

Whatever be done in electric smelting is generally expected to be based on the reduction of zinc oxide (or its compounds) by carbon (and carbon monoxide); but the decomposition of zinc sulphide by iron has also been contemplated. The former is the basis of ordinary practice. The latter has been exploited in the electric smelting of Coté-Pierron and of Imbert-Thomson-Fitzgerald. While the decomposition of zinc sulphide by iron has not found application in ordinary furnace work, it has been repeatedly suggested. Indeed, the Imbert process was originally such a suggestion, the use of an electric furnace for its execution being an afterthought. The Coté & Pierron process was tried experimentally at Lyon, France, in 1906, and in 1907 at Arudy, in the Basses-Pyrenees, and was ephemerally the subject of many articles in the technical press, but lately it has not been mentioned, and I am inclined to think that the results were not satisfactory. The Imbert-Thomson-Fitzgerald furnace has been in trial at Hohenlohehütte, Upper Silesia, during the last two years. No authoritative reports of the results recently obtained there have been made public. The imperfect news that seeps through professional and commercial channels is conflicting. I shall not in this paper discuss either the Coté-Pierron or the Imbert-Thomson-Fitzgerald proposals, but shall confine myself to a consideration of the reduction of zinc oxide by carbon. In this discussion I shall draw upon general metallurgical experience, upon the information obtained in experimental electric zinc-smelting at McGill University, and upon the authentic reports of work that has been done elsewhere.

The reduction of zinc oxide is an endothermic process, i.e., heat must be supplied to it. This may be done either by the external heating of the retort containing the charge by the combustion of coal, or by internal heating by means of the electric current. The theoretical advantage of the latter rests in the possibility of developing the heat in the midst of the charge, i.e., in the heart of the place where the work is to be done, a condition that does not exist in ordinary external heating. The electric furnace may be of two types, namely, the arc furnace and the resistance furnace. To draw a familiar analogy, the arc furnace is exemplified by the ordinary arc lamp used for illumination; the resistance furnace by the ordinary incandescent lamp. Another type of furnace, namely, the induction furnace, will not here be taken into consideration.[1]

Types of Furnaces

The original De Laval furnace was a simple arc furnace, in which the heat of an electric arc, formed between electrodes projecting horizontally into the furnace, acted upon the charge of ore lying under it. Among the various types of resistance furnace we may have that in which the current passes through a resistor of carbon (as in the Imbert-Thomson-Fitzgerald), or that in which the electrodes dip into the charge to be smelted, or into a bath of slag which serves as the resistor. It will be unnecessary for the present consideration to go any further into the subject of the types and design of furnaces. It is the fundamental metallurgical principles upon which it is still most important to center attention. In the present status of the art of electric zinc-ore smelting, the functions of the electrician are subordinate to those of the metallurgist.

In the earliest attempts to smelt zinc ore electrically, the conception was of an apparatus similar to an ordinary retort, but electrically heated. In some of our early experiments at McGill University, we used furnaces of analogous character. The rate of reduction in these furnaces was about on a parity with the rate in the ordinary retort, temperatures being equal, which was, of course, what was to be expected. These experiments, made primarily for another purpose, confirmed the idea that if electric smelting were to offer any advantage, it must be conducted continuously. Here is introduced a departure from the conditions of ordinary smelting, which is an intermittent operation, conducted in two stages, the first comprising the expulsion of aqueous vapor, and the decomposition of hydrocarbons and carbonates; and the second being that of the reduction of the metallic oxides. If zinc smelting is to be done continuously, it seems that the operation must be confined to the second stage, which implies that the things that ordinarily happen in the first stage must be caused to take place by a previous preheating. With such a preheating the actions in the furnace become essentially the same, but there are certain important differences.

Differences from Ordinary Practice

One of these differences pertains to the carbonaceous reduction material that is mixed with the ore. It has been shown

[1] An induction furnace has been proposed by G. Gin, but it has not been tried, so far as I am aware.

by Boudouard that the permissible limit of carbon dioxide in the gas of the zinc retort is very low; varying with the temperature, but still very low at the very high temperature of 1500 deg. C., a temperature that is not attained in practice. When the permissible limit is exceeded, carbon dioxide acts oxidizingly upon the zinc, and coating the condensing globules of the latter prevents coalescence and forms powder.

The gas issuing from the zinc retort of practice is within the permissible limit of carbon dioxide, or nearly within it, and the zinc is condensed chiefly as molten metal. Conversely, all attempts to smelt zinc ore in the blast furnace have resulted only in the production of powder because of inability to control the percentage of carbon dioxide. Small quantities of molten zinc have been occasionally found in the blast furnace, undoubtedly due to the accidental occurrence of favorable conditions.

The uniformly favorable conditions of the ordinary zinc retort are due to its small size, its confined character, and the presence of an immense excess of carbon in the charge. Carbon dioxide, resulting from the reduction of zinc oxide, and from other reactions, is immediately exposed to the great surplus of finely divided, intimately admixed, incandescent carbon, and is reduced by it to monoxide.

Continuous charging implies discharging of the residue without interrupting the smelting operation. This in turn implies the discharging of the residue as a slag that will run. Both conditions imply the absence of any great excess of carbon, which cannot be slagged and cannot be permitted to accumulate in the furnace. In this important particular, the internally heated, continuously operated retort or furnace differs materially from the externally heated, intermittently operated retort.

Carbon Dioxide

In our experimental work at McGill University, we have commonly found high percentages of carbon dioxide in the gases from the furnace, much higher than exist in the gases from the ordinary retort. Besides this difference we have observed the presence of considerable quantities of carbon and ore-dust in the condensers, indicating another variation from the conditions of the ordinary retort. In the continuous feeding of the charge into the electric furnace, there is naturally stirred up some dust which may be, and probably is, carried out into the condenser by the relatively strong outrush of gas and vapor; the latter may indeed entrain some dust from the surface of the charge in the furnace. There may be some other physical disturbances.

The effect of the carbon dioxide in the gas has been recognized by Coté & Pierron, by Johnson, and by other investigators who have caused the gas and vapor from the retort to pass through a column of incandescent carbon, the purpose of which is to act as a secondary reducer. This is believed to be, at least, ameliorative.

Except for the metallurgical differences that have been previously pointed out herein, the reactions and condition in the internally heated retort are essentially the same, providing that the charge introduced into the former be preheated to a degree corresponding to the preheating that takes place in the first stage of the intermittent process. The gradually introduced charge, with its interstitial air, should not involve any new conditions, except those previously noted, inasmuch as the gas inside of the furnace displaces the interstitial air before the charge enters into the smelting chamber. The reduction of lead and iron, developing carbon dioxide, and the multiplicity of complex side-reactions, take place in one kind of retort as well as in the other.

There is no positive evidence that the electric current passing through a furnace plays any metallurgical part other than thermic. Harbord reports no observed difference between the actions of the arc furnaces at Sarpsborg and the resistance furnaces at Trollhättan, except in the efficiency of the energy supplied. At McGill University we observed arcking in the furnace when a resistor of fragments of carbon was used; and this arcking was followed by disturbance in the furnace that we have been unable to explain; but there was no such occurrence in a furnace with a continuous resistor of carbon, in which furnace the reduction of zinc oxide appeared to take place regularly and normally. This particular furnace was provided with a peep hole (closed by mica), through which the process of distillation could be observed. The resistor was vertical in position, the charge surrounding it. The distillation proceeded most actively around the resistor, the heating element, the charge coning down toward this as the zinc was expelled, and the interior of the furnace maintaining an even incandescence.

Speed of Reduction

Our attempts at McGill University to reduce zinc oxide in an intermittently charged, electrically heated retort, resulted in so slow a reduction that the prospect of advantage seemed to be insignificant. I refer to a retort in which the charge was introduced in the usual manner at the beginning of the operation, the residue to be discharged as an unfused ash. There was, of course, a possibility of converting this from an intermittent to a continuous operation, but, as I have already stated, the slowness of the reduction under these conditions dispelled any such idea. When we changed to the scheme of starting the furnace with a bath of slag, continuously introducing the charge upon this bath, we found immediately that the reduction became relatively rapid. I am unable to offer an adequate explanation of the improvement in this respect. I can but state that a retort of small proportions smelts a surprisingly large quantity of charge by comparison with the retort of ordinary practice at an equivalent temperature. With a furnace of which the laboratory was a plumbago crucible 12 in. in diameter, we have been able to smelt 10 lb. of ore per hour. With a furnace 18x18 in. in horizontal section, we smelted 737 lb. in 23 hours. We have learned consequently that the claims of extraordinary capacity of electric zinc smelting furnaces of comparatively small size are well founded.

Bearing in mind the main difference between the conditions of ordinary and electric zinc smelting, we may pass on to a consideration of similarities. There is no reason to believe that the reduction of the metallic oxides, the reactions between metals, oxides, sulphides and sulphates, the scorification of oxides, and, in short, the multiplicity of complex reactions that we believe to take place in the externally heated retort, will be any different in the internally heated, the nature of the charge and the temperature remaining the same.

The Matter of Temperature

With respect to the matter of temperature, that of the electric furnace may be anything that it is pleased to make it, within the limitations of the material whereof the furnace may be constructed. In the ordinary practice of zinc smelting, the tendency in Europe during recent years has been to drive the furnace harder and harder. A furnace temperature of 1400 deg. C. was once thought to be high, but now 1500 deg. C. and upward is reported. Such high temperatures imply, of course, the necessity for much more substantial furnace construction and a high class of refractory material. Naturally the average life of the retorts is reduced. The actual smelting temperature, i.e., the temperature inside of the retorts, is about 100 to 200 deg. less than the furnace temperature. In this particular the electric furnace has the advantage that the full temperature of the furnace is realized in just the place where the smelting is to be done.

The amount of zinc remaining in the residuum, whether the latter be an ash (loose or clinkered) or a slag, depends primarily upon the temperature of the smelting and the fluxing of the ore. Conditions favorable to low zinc retention are high temperature and highly calcareous slag. It is possible to discharge from the electric furnace a slag containing less than 1% of zinc. We have made such slags at McGill University, and other experimenters also have done so. The ability to do that does not, however, imply

either commercial feasibility or advisability. It may be impossible to maintain a furnace in continuous operation under the conditions necessitated by the production of such a slag. This matter has not yet been worked out. The slag made at Trollhättan, during Mr. Harbord's test, was high in zinc. We do not as yet know much respecting the shape that the smelting chamber of an electric furnace will naturally assume, the formation of refractory accretions on the walls, the deposition of sows of metallic iron (that doubtless will be produced in the same way as in the ordinary retort), and the difficulties that are likely to occur in continuous operation from these things.

Smelting at Trollhattan

The operations at Trollhättan and at Sarpsborg were the subject of a report by F. W. Harbord, in 1911, which is the only recent source of technical information respecting them. Mr. Harbord's report was made privately for commercial purposes and did not go fully into the metallurgy of his subject. Mr. Harbord conducted a test at Trollhättan, during which 537 metric tons of ore were smelted, the test extending through 27½ days. This is the longest continuous run on a large scale that has been reported. The ore was essentially a zinc-lead ore, rather than a zinc ore, and was high in silver, containing 36% zinc, 24% lead and 30 oz. silver per ton. In making deductions from the experience in smelting this ore, we must hesitate in applying them too freely to the cases of what are more distinctly zinc ores. Mr. Harbord extracted 64% of zinc, 74% of lead and 46% of the silver as metals, which percentages would be slightly increased by further treatment of certain incidental products, but even so the metal recovery would still be relatively low.

A summary of Mr. Harbord's report is to be found in the Engineering and Mining Journal of Feb. 10, 1912. Briefly, the furnaces were of the resistance type, having one large vertical electrode passing through the roof, the other electrode being a carbon block bedded in the bottom of the furnace. Each furnace smelted about 2800 kg. of ore per 24 hours. The product was partly metal and partly blue powder and oxide, containing about 54% of zinc and 20% of lead. This powder is mixed with fresh ore and recharged, when a larger percentage of the metal volatilized is recovered as metal. The first operation of smelting ore alone is to be regarded mainly as a concentrating process for the production of a rich oxide. The regular charge was 100 kg. of roasted ore, 200 kg. of powder, 25 kg. of coke dust and 5 kg. of lime. Thus for every ton of ore smelted, two tons of powder had to be resmelted; indeed rather more than that, there having been an accumulation of powder during the run.

Recovery of Lead

In the ordinary retort the lead content of the ore is reduced and is partly volatilized, condensing with the zinc, which it contaminates; and partly remains as metal in the residuum, from which it is recovered by smelting the latter, or by jigging and smelting the concentrate. The percentage of lead volatilized increases with the temperature. In the electric furnace lead behaves in the same way, but in fusing the residuum into a slag, the lead is given an opportunity to separate and thus may be tapped separately, which in so far is an advantage. On the other hand, the desirability or necessity of smelting at a high temperature leads to the collection of a leady spelter, which must undergo a subsequent refining, and the experience at Trollhättan has indicated difficulties in the furnace construction because of the lead.

I am not greatly attracted by the possibility of smelting for lead and zinc in a single operation, much less by aiming also to make a matte (although that may be inevitable), which adds to the difficulties, nor do I see any good reason to head in that direction. In most kinds of mixed sulphide ores the galena is easily separated to a fair degree by gravity concentration, and no loss need be experienced in such a separation, inasmuch as the galena and the blende-pyrites may be easily collected in filter bins. It should be the policy first to subject the ore to this cheap process, very likely cutting out a portion of the gangue sufficiently clean to be discarded, and pass the galena on to ordinary lead smelting, also a relatively cheap process, rather than to deliver all of the ore to the zinc-smelting process, which must inevitably be relatively dear, whether it be the ordinary one or the electrothermic.[2]

There will be, of course, from such a treatment a percentage of lead in the blende-pyrites, and being there it will be desirable to extract it, but it is troublesome both in the roasting and in the smelting, and I conceive that the electric smelter, like the ordinary smelter, will rather have a zinc ore without lead than with it, unless it can be obtained on terms that compensate for the disadvantages. It may be accepted, however, that the electric furnace will probably obtain a higher extraction of the lead and at less cost than is possible in the ordinary method of smelting, and there are some ores wherein the galena and blende are so intimately mixed that mechanical separation is impossible, which may be treated more advantageously in the electric furnace than in any other way. I do not by any means regard this as a step in metallurgy that has yet been accomplished, but it is a possibility. The work at Trollhättan has been in this direction.

[2]The great progress in the treatment of mixed sulphide ores has been in the development of improved processes of mechanical concentration. See my paper on this subject in Proceedings of the Canadian Mining Institute, 1911.

Condensation

It has been assumed by some investigators that the difficulty of condensing the vapor resulting from the reduction of zinc oxide, lies chiefly in the condensing apparatus. It may be taken for granted that the condenser connected with an electric zinc-smelting furnace, required to deal with a relatively large quantity of vapor and operating under some conditions different from those existing in connection with the ordinary furnace, must be of dimensions and design conforming to the new conditions.[3] It has been found possible to condense the zinc satisfactorily as spelter from the electric furnace treating zinc powder and galvanizers' dross. This has been done at Trollhättan, where, in the refining of crude zinc, but 9.8% of powder has been collected. In refining 111,794 kg. of leady spelter, Mr. Harbord obtained only 11,209 kg. of powder. Charles A. Weeks reported, in *Metallurgical and Chemical Engineering* of July, 1911, that in the refining of zinc dross in an electric arc furnace, during a run of 36 hours, no powder was made. In a private communication, Mr. Weeks informed me that this furnace was built and operated in the works of the General Electric Co., at Schenectady, N. Y. Accepting the foregoing evidence, which is confirmed by experience at McGill University, the reason for the production of blue powder is to be sought not in the condenser proper, but in the character of the gas and vapor delivered to the condenser; in other words, to the conditions that exist and the reactions that take place inside of the furnace itself. It has been found that when metallic zinc is simply distilled, there is no great difficulty in condensing the vapor in a liquid form, but when the vapor originates from the reduction of zinc oxide, there is difficulty.

Nearly all experimenters in ore smelting by the reduction of zinc oxide by carbon have been baffled in the attempt to condense a commercial proportion of the zinc as molten metal. We have encountered this difficulty in our experimental work at McGill University, and have not yet been able to master it. The reason why zinc vapor from the electric furnace should condense in this way has not yet been satisfactorily explained. It may pertain to the differences between the conditions of ordinary smelting and electric smelting that I have already men-

[3]The condenser of the electric furnace receives no radiant heat from the front of the furnace nor from the glowing charge in the retort. On the other hand, the condensation of a large amount of zinc vapor liberates a relatively large amount of latent heat. The balance between these conditions has by no means been worked out. We find some experimenters having artifically to cool the condenser and others to heat it.

tioned; it may pertain also to other conditions. I shall not advance hypotheses respecting this; I shall limit myself to the mere statement of the fact.

Blue Powder

At the present time the matter of reducing and distilling the zinc and condensing the latter chiefly as spelter and blue powder is the crucial point of electric zinc-ore smelting. Until that has been accomplished, I can see no future for the process, except under special conditions of extraordinarily cheap power, peculiar kinds of ores, etc. On the basis of ore alone, the consumption of power at Trollhättan was 2078 kw.-hr. per 1000 kg. of ore, but for every ton of ore smelted about two tons of powder had to be resmelted. The smelting of 1000 kg. of ordinary zinc ore is reckoned to require from 900 to 1000 calories of heat, which is equivalent to 1047 to 1163 kw.-hr. of electric energy, these figures representing the cases of ordinary ores containing 25 to 50% zinc. In one run at McGill University, lasting 24 hours, with a resistance furnace, 18x18 in., Dr. Stansfield determined the power consumption per 2000 lb. of ore smelted as 1610 kw.-hr. (about 1771 per 1000 kg.). It has been claimed that it is possible to smelt 2000 lb. of zinc ore with 1000 kw.-hr. While it is doubtful whether such a result has yet been actually realized by anyone, the claim is plausible with respect to certain kinds of ore, although even then it is necessary to assume a high furnace efficiency. It would seem that 1200 kw.-hr. per 2000 lb. of ore would be a sufficiently brilliant realization.[4] Even such a one would put electric smelting upon a sound basis in so far as power consumption is concerned.

Cost of Smelting

The art of electric zinc smelting is still too much in its infancy to permit of much more than speculation respecting the probable cost. The only data of operation on a large scale continued for a considerable period of time that are available are those of Trollhättan, where electric power, labor, etc., are obtained very cheaply. If the Trollhättan figures be applied to the conditions of power at $20 per horsepower per annum, labor at $3 per eight hours, and other elements in proportion, electric zinc smelting on the basis of the metallurgic results obtained there would be out of the question. If it becomes possible to smelt with 1200 kw.-hr. per ton of ore, to reduce materially the labor and electrode costs, and to extract 90% of the metals, there will be some chance.

As to the probable cost of plant we are still greatly in the dark. It is hardly to be expected that the electric plant will be of any less cost than the coal fired. Comparing operating costs, there will be the same expense for administration, general charges, yard labor and roasting in each case. Heating coal will stand against electric current, say 1 to 1.5 tons against 1200 kw.-hr. The relative consumption of reduction coal is uncertain. The retorts of ordinary practice will be dispensed with, but instead of them the electric smelter will have an electrode expense. The relative cost of repairs and renewals and miscellaneous supplies is uncertain; also the matter of labor. At first thought it seems that the labor on a furnace smelting 6200 lb. of ore per day ought to be less than in connection with 80 Rhenish retorts or 150 Belgians, but the experience at Trollhättan does not yet confirm that idea, though, no doubt, improvement will be realized in this particular.

Limitations

In the report of the Commission to Investigate the Zinc Resources of British Columbia, published in 1906, I made the following remarks:

> The successful smelting of zinc ore in the electric furnace is a matter which depends chiefly, indeed I may say solely, upon the cost of the process. De Laval has shown that it can be done. The doing of it profitably is quite another question. This is dependent chiefly upon the cost of power, the electrical efficiency of the furnace, and finally upon the purely metallurgical difficulties that pertain to the reduction of zinc oxide and the condensation of the metallic vapor.
>
> . . . . . .
>
> From the present development of electrothermic smelting of zinc ore, and the calculations respecting it, the following conclusions may be drawn:
>
> 1. Electric smelting will never displace ordinary smelting, if it be necessary to generate the power from coal.
>
> 2. Electric smelting may be, in the future, economically conducted at places where very cheap hydro-electric power is available.
>
> 3. Aside from the question of power, up to the present time certain peculiar and serious metallurgical difficulties in electric smelting have not been satisfactorily overcome.

During the six years that have elapsed since those words were written, much has been learned respecting their subject, but as generalizations they remain as true today as they were then.

The successful achievement of smelting zinc ore in an electric furnace will probably be the result of learning how to run the furnace; i.e., how to control the process, rather than of any distinct invention. I conceive that the electric zinc-ore smelting furnace will be an apparatus of general character, such as is the blast-smelting furnace for lead ore, etc. This is to say: Lead ore may be successfully smelted in many forms of furnaces of the same generic character, but with variations in their lines that are of important economic effect. Once it has been learned how to run an electric furnace for zinc smelting, I believe it will be found that the process can be conducted in many forms of furnaces conforming to the general type, wherein the principle will be the same although the economic results may differ widely.

[4]It may be possible to economize electrical energy by the direct use of coal or gas for part of the process. Perhaps the carbon monoxide discharged from the condenser may be utilized. However, I do not consider knowledge of electric zinc-ore smelting to be far enough advanced yet to warrant any calculation of this kind.

Diamonds in German Southwest Africa

The production of diamonds in German Southwest Africa, according to the report of the German Diamond Regie, amounted in the year 1911-12 to 816,296 carats, which were sold by the company; the quantity was 798,865 carats in the preceding financial year. The average price realized was 25.602 marks (1 mark = 23.8 cents) per carat, as against 26.775 marks in 1910-11, the reduction being chiefly attributed to the further decline in the size of the stones, of which 6½ formed 1 carat, as contrasted with 5¾ stones per carat in the previous year, says the *African World.*

Of the total production, 94.55% was forwarded to Antwerp, 4.79% to Germany, and the balance, 0.66%, to London. A large portion of the diamonds forwarded to Germany was, however, sent abroad in an uncut condition, so that the German consumption scarcely amounted to 3%. The total production was raised by 14 Southwest African companies, of which 5 were responsible for 96.32% of the total. The net profits realized by the Regie amounted to $203,420, and it is proposed to pay a dividend of 10%, being the same rate as in 1910-11.

The output of the United Diamond Mines at Luderitzbucht amounted to 2480 carats in March, against 2075 carats in February. It is stated by the *Financial Times,* of London that it is officially announced that, owing to a new agreement between the Government and the Antwerp syndicate, German Southwest African diamonds will be sold at higher prices than hitherto.

Titanium Rails

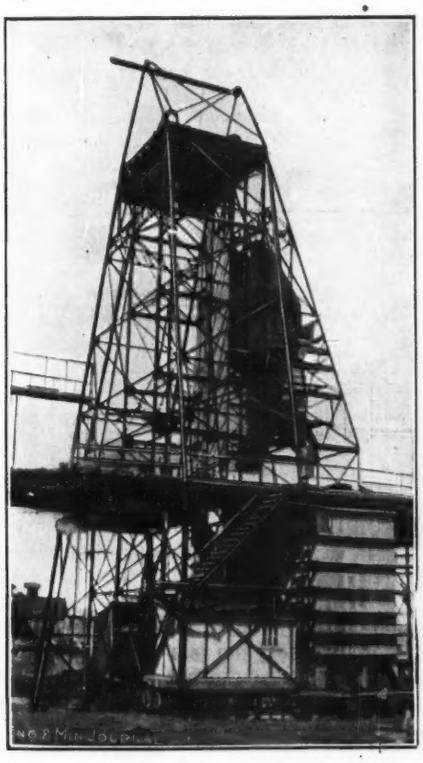
There is at present much experimenting to produce a rail that will be more resistant to wear than those now in use. Over 150,000 tons nickel- and nickel-chromium-steel rails were rolled in 1910, beside about 80,000 tons of chromium, manganese, vanadium and other similar steels. However, most of the experimenting was done on titanium steels, of which 250,000 long tons were rolled says the U. S. Geological Survey. There need not be any titanium left in the steel, its value being in its absorptive power for nitrogen, oxygen, and other impurities.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Steel Headframe at Negaunee Mine

The new steel headframe, recently completed at No. 3 shaft of the Negaunee mine of the Cleveland-Cliffs Iron Co., is shown in one of the accompanying illustrations. The circular, concrete-lined shaft is 940 ft. deep and 17 ft. inside diameter. There are two skip compartments through which hoisting will be done in balance, and a cage compartment



STEEL HEADFRAME AT NEGAUNEE MINE AND THE NEGAUNEE STOCKPILE VIADUCT

with a counterweight, consisting of a length of 11-in. steel shafting in a 12-in. pipe. The arrangement for handling sheaves is convenient. To take a sheave out, it is hoisted to the horizontal member at the apex of the headframe, moved to the side and lowered.

The steel stockpile trestle is also shown in an illustration, and is an innovation at the iron mines, where it is customary to build a wooden trestle every year. The total length of the trestle is 3000 ft. It extends an equal distance in either direction from the headframe. A single line of reinforced-concrete pillars about 5 ft. in diameter and over 100 ft. apart supports the two tracks. The cars are self-dumping, which is not the case at most mines, where from two to eight men are required to dump the cars.

Some Improvements in Drill Sharpeners

A number of changes have been made in the Word drill sharpener used at the Champion mine in the Lake Superior copper country, to make that machine meet more closely the requirements of that mine. A special fuller for drawing out the wings of the dull bits and a four-piece die for forming them are among these improvements. By their use the manner of working out the metal in hand sharpening is approximated.

In order to make the tail block against which the drill steel abuts during sharpening more rigid, it is carried on heavy I-beams, so that the tail-block guides are rigid and a screw feed can be used on it without danger of breakage. Instead of throwing the valves by a special controlling rod and thereby bringing the two die hammers into a retracted position, as is done in the ordinary Word sharpener, both the vertically and horizontally disposed hammers are thrown out of the way automatically by the air as soon as it is turned on. In the old method the lifting device was apt to wear and get out of order so that the vertical hammer would be thrown at the wrong time, often spoiling a finished drill. In the Champion method of accomplishing this withdrawal of the hammers into a retracted position, the throttle piston, whenever the treadle control is released, is carried back by the air and shuts the air off from the valve chests of the hammers, at the same time uncovering an auxiliary port allowing air to enter behind the piston so as to hold the hammer in a retracted position and out of the way. The valve and the hammer piston are specially designed to accomplish this, so that there is only one lever to operate, and that a foot lever, to control the running of the two hammers, and the only auxiliary lever is the hand lever that is used to run the tail block forward or backward.

In order to lessen the breakage on the pistons both of these operate through guide collars so that the side bound of the hammer on striking the die and the steel is limited. This has reduced the strain on the piston rods which is usually considerable. Another feature is that both the bedplate casting and the column supporting the vertically disposed hammer are hollowed out so as to serve as an air receiver for the sharpener.

In order to diminish the wear and tear as well as the trouble which comes from leakage from the wearing of a spool valve, a hollow double-ported spool valve with a small throw is used; this has been patented by Ernest Pemberthy of Painesdale. The details of this valve which has worked in these sharpeners so well that only one of the four used on the two machines has been replaced during 20 months of service, will be described in another article. It is only mentioned here so that the reader will understand why, in the enumeration of the repairs on the drill sharpeners, there is mention of only one valve being replaced on the four cylinders that are in constant use nine hours a day.

In order to diminish the danger of smashing down the drill wings too much in drawing them out before forming the finished edge, a fuller arrangement is so fastened as to swing in by a horizontally disposed lever under the vertical hammer. In this way the fulling blow is struck at short stroke so that the speed of the hammer is less and the blow is considerably lighter than when the fulling is done with the vertical hammer at full stroke. This fuller is made in two parts so that in case one wing needs more fulling than the other it gets the benefit of the blow. This fuller fastens by a pin to the fuller holder so as to let it rise up with the thickness of the wings that are to be drawn out. The fuller and its holder slide in on this pin as a guide until they strike a collar that stops the fuller in its proper position with respect to the openings of the die block on which it rests while being used. When to one side this fuller is carried on a resting block that also acts as the key block to hold in place the die for shaping the sides of the drill and the bottom sides of the wings while they are being spread with the fuller attachment.

In sharpening the drills a four-piece die is used. These four parts operate in a sleeve which, owing to the shoulders on each end of the die pieces, also keeps them from flying out. The advantage of the four-piece die is that the die faces can easily and cheaply be ground down on an emery wheel without drawing the temper. In the case of the solid dies it is necessary to draw the temper and machine down the faces in order to straighten out the bottom of the die grooves. Then the die has to be retempered. This means considerable trouble and expense and as a result the dies are neglected and the bits of the drills allowed to become rough on their cutting edges.

By the use of the fuller the speed of sharpening is greatly increased, especially in making up new drills. One new bit was formed in 45, another in 35, while a long bit took 70 seconds. Of course, the steel was already hot. By using the four-piece die the machine sharpener is made to similate hand sharpening in the way that the metal is drawn out and formed into the bit much more than is the case in machines using a solid die.

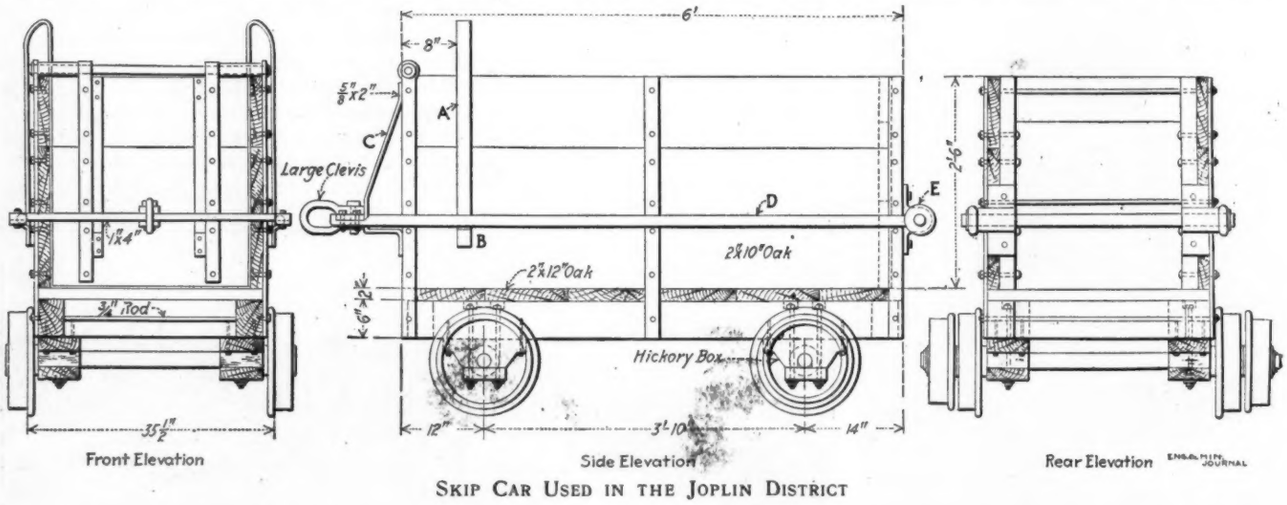
With the sharpener and the additional equipment above described, 620 cross bits varying in gage from 2¼ in. on the starters to 1½ in. on the 8-ft. finishers were sharpened on one machine in five hours. At present two machines are sharpening about 1100 drills per day as well as making up the new steel that is needed from time to time. These two machines, of course, are not crowded, nor were they when sharpening 1200 drills per day, which is the number when the mine is working at its normal output. Two have to be used as the work is too much for one sharpener.

The repairs on the drill sharpeners since they were first installed, Apr. 27, 1909, with the equipment that has been mentioned, two machines being in use and an average of about 1100 drills sharpened per day, have been: Dec. 19, 1910, one hollow spool-valve for hammer chest, one new set of dies, one tail-block nut, one back-head spring; Jan. 12, 1911, upright piston rod broken and replaced; Jan. 12, 1911, refaced fullers. Jan. 30, 1911, changed top and bottom dies; March 13, 1911, new set fullers; Aug. 24, 1911, horizontal piston rod broken and replaced; Sept. 30, 1911, new tail-block nut put in.

The cost of the sharpening, exclusive of power and upkeep of the machines, for the year 1910, during which time at the three mines, the Baltic, Trimountain and Champion, 638,593 cross bits and 2002 single bits were sharpened and 9500 new drills were made, was, for labor, 1.5c. and for fuel 0.16c., or a total of 1.66c. per drill, exclusive of repairs or cost of power. The labor consisted of seven drill sharpeners at $66.57, three men tempering at $68, and four boys at $35 per month. During this time 310,652 lb. of coke was used, or 0.457 lb. coke per drill sharpened and tempered. Credit for these different innovations belongs to James Treganza, blacksmith-shop foreman, P. P. Daume, machine-shop foreman, Ernest Pemberthy, the draftsman, and W. J. Richards, the master mechanic, as working in common they gradually thought out the changes that have been made.

Skip Car for Flat Grades

The details of construction of a skip car for flat grades is shown in the accompanying illustration. These cars are used in the Joplin district, chiefly for transferring the ore from a subsidiary shaft to the mill hopper or bin, but which are also used in some instances for hauling boulders up an incline to the dump, and in other instances for conveying dewatered tailings to the tailings pile. In all instances, these cars are used on a flat grade, so that a front door is required to hold the load in place.



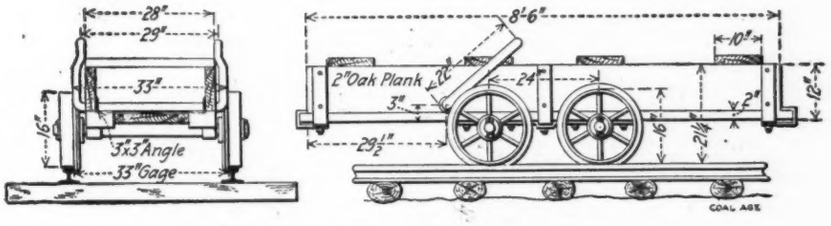
SKIP CAR USED IN THE JOPLIN DISTRICT

The body of the car is made of 2-in. oak, lined on the inside with No. 12 plate, and held together by iron straps at the end and middle. The wheels are keyed to the axles and the axles rotate in bearing pieces of hickory. The bridle is fastened to the skip by side straps to a cross piece of round iron at the rear end of the car. Guide pieces *A* are bolted to the sides near the front end, so as to guide the straps back down the sides of the car in case they move above the sides of the car when dumping. Brackets *B* are also provided for the bridle straps to rest on while the car is being filled and while the cable is slack.

As the car dumps by the raising of the rear wheels above the line of the track, the tread of the back wheels is made wider than that of the front wheels. This is effected by putting two separate wheels on the rear axle, the outside wheels on each side being loose. On this account,

no special wide-faced wheels have to be cast for these skip cars. Because the grades are flat, the cars have to be fitted with a front door. This is latched by the bridle which, after the car dumps, drops down on to one or two bracket pieces *C*, that are bolted to the door of the car.

The dump consists of two timbers put up at such an angle that the rear end of the car is raised about 4 ft. in a distance of about 10 ft., and owing to the slow speed with which the car is hoisted into the dump, no attempt is made to ease the shock by curving the dump track. The raising of the rear end of the car raises the cable and lifts the bridle off the brackets, unlatching the doors. When the car is lowered back out of the dump, the bridle drops as the rear end of the car falls and the door is again locked in place. For self-dumping surface cars running up fairly steep inclines, but where the car must be in a horizontal position while being loaded, a rear-dumping car in which the door is unlatched by a trip may be preferable, but on flat inclines the front-dumping car seems to be better.



SAFETY DEVICE FOR MAN CAR ON INCLINE

Automatic Mine Pump Control

Plans are now being made at the Homestake mine in South Dakota for installing electric-driven pumps for raising all the mine water to the tunnel at the 200-ft. level through a flume in which it will run out to daylight. Worthington pumps of 1000 gal. per min. capacity, driven by Westinghouse motors will be installed in pairs at the 500, 800, 1100, and 1400-ft. levels, and near the Old Abe shaft in which the pump columns will be placed.

The pumps will be mounted upon a roof of I-beams and reinforced concrete over the sumps, all of which are 23 ft. square. The pumping will be controlled by floats in the sumps arranged so that when the floats rise a switch will be closed automatically and pumping will start. When the floats sink in the sumps to a certain level the switch will be opened and pumping stopped.

A Cornish pump that has been used satisfactorily in the Old Abe shaft for 30 years will be dispensed with. Sinking work has been going on in the shaft for nearly a year and it is the intention to maintain the bottom a little lower than that of the Ellison or main hoisting shaft. A pump will also be installed at the drainage tunnel which will be used for raising the water to the tanks in case it is required in the mills.

Safety Device for Cars on Inclines

Apropos of the remarks, recently published in the JOURNAL, regarding the use of safety appliances on cars and skips in inclines, the device described by A. W. Evans, in *Coal Age*, is of interest. The device is used on the man cars in the Rockwood slope of the Roan Iron Co., at Rockwood, Tenn. It may be used on the cars of any flat incline, but where the grade is steep the device would be useless.

As shown in the accompanying illustration, the appliance consists of two 1½-in. round iron bars, one attached to each side near the rear end of the car. While hoisting, the bars are thrown back, so that they trail upon the ground. Should the rope break and the car start to move backward, the ends of the bars would seize on the floor of the incline and act as props upon the car. The device is only effective for preventing accidents while hoisting. Nothing is said of a safety device to stop the car in case of breakage of the rope while lowering men down the incline.

Strength of Manila Rope

Manila rope is measured by circumference instead of diameter, therefore, a 3-in. rope is nearly 1 in. in diameter. The strength, according to *The Foundry*, depends upon the quality of the fiber and the solidity with which the rope is twisted. A 3-in. rope, soft laid, has a maximum strength of about 7300 lb., while a hard laid rope will withstand up to 9000 lb. The breaking strength of ropes can be obtained approximately by multiplying the square of the circumference by 8 and the product by 100, which gives the strength in pounds. For blocks and falls, the rope should be figured at one-eighth its breaking strength, using two double blocks of suitable size. Thus, if 1000 lb. is to be raised regularly, two double 8-in. blocks, equipped with 3-in. manila rope, should be used. For direct pulls on single ropes, the latter should be operated at only one-twentieth of its breaking strength, to allow for wear and tear.

Sinking Placer Test Pits in Siberia

In the Amur district of Siberia, prospectors work in pairs and sink 30 pits to an average depth of 17½ ft. in the four winter months, November to March, states Leon Perrett.[1] Sinking to prospect gold- or platinum-bearing deposits is done by the thawing method, i.e., fires are built on the bottom of the pit, which thaw the gravel to a depth of about seven inches. The thawed gravel or clay is then excavated. The sinking is done at the rate of three feet per shift, and at a cost of 45c. per ft. including cost of overseeing, washing samples, and maintaining a few horses. From 0.9 to 1.3-cords of wood are burned to sink a pit to a depth of 18 to 20 feet.

The pits are dug to depths of 11 to 28 ft. or more and are about 5x6 ft. in section. The excavated material is thrown to the surface from the shallower pits, while a windlass is used for the deeper. If the pit is too deep for the shoveler to throw the clay or gravel to surface and it is not to be sunk deep enough for a windlass, a "shelf" is built, i.e., recesses are cut into the walls in which the ends of beams are placed, upon which a floor of boards or poles is laid so as to cover about half the section of the pit. The excavated material is thrown upon this platform, and then to the surface.

This method of prospecting may be used in regions where there is little snowfall, where heavy uninterrupted frosts prevail during a few months, and where sufficient wood for fuel is available. The alluvial deposit should not be over 30-ft. deep, as at greater depths the gravel freezes slowly or not at all. The natural freezing may be expedited by using stoves to accelerate the draft in the following ways:

1. By dividing the pit into two equal compartments with brattice cloth, and maintaining a good draft by a small iron stove on the pit bottom.

2. By dividing the pit into two unequal compartments with brattice cloth extending to within three feet of the bottom, the larger division then being covered at the surface with a closely fitting floor into which is inserted a tall wooden box made of tightly joined boards with inside dimensions 21x28 in. At a distance of 4½ ft. above the floor an iron grating is fixed in the box, which is accessible through an opening provided with a tight fitting door. Through this

[1]Bull. 92, I. M. M.

opening a perforated drum of sheet iron is placed on the grating and in which a charcoal fire is built to induce the draft required to promote freezing.

3. By placing a bottomless iron box about 28-in. high on the bottom of the pit. This box is smaller than the pit so as to leave a 10 or 14-in. space all around between its sides and the walls of the pit. The box is forced into the gravel or clay as far as possible and then the joint is made air-tight by packing earth around it. From opposite ends of the top of the box two iron pipes, 3 or 4-in. in diameter lead to the surface; one opens to the air, the other is fitted to a stove at the collar in such a manner that the draft for the stove is drawn through this pipe. The doors of the stove are made air-tight with asbestos. If the stove is kept burning continuously the bottom of the pit can be frozen in this way in half the time required by either of the other methods. The sides of the pit freeze independently.

Heating Water

Water for a 50-gal. tank can be heated in an ordinary upright heating stove, such as is used for heating large rooms, by running pipes down through the grid in the top of the stove. This is done at the plant of the St. Louis Smelting & Refining Co., in the Flat River district of Missouri, where only a small quantity of hot water is desired, as at the change house for some outlying shaft, or for the machinists in a small wash room away from the main change houses.

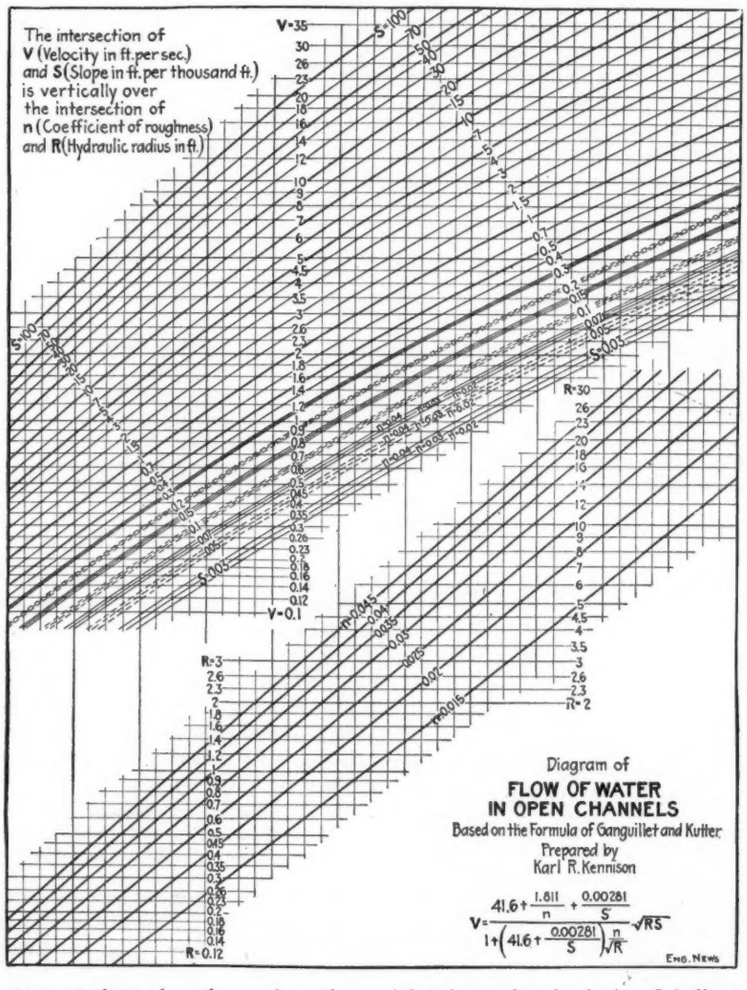
In case the water contains much scale-forming compounds, it will be better to put in a pipe of large diameter, say 8 in., the top cap of which is tapped to receive two 1¼-in. pipes for circulating the water back and forth from the hot-water reservoir tank. Any scale that may form can then be cleaned out easily from the large pipe. Using this large pipe which is carried down about 18 in. into the stove, the heating is not so efficient as a coil of 1¼-in. pipe, carried down through holes in the top grid, because when heated in that way the water circulates as fast as its temperature rises, while a proportionately greater heating surface is obtained by the use of the coil. Scale, though, gives more trouble.

To Anneal Cast Iron

A German authority says, according to the *Engineer and Fireman*, to anneal cast iron, heat the whole piece to a bright glow and gradually cool under a covering of fine coal dust or similar substances. Small objects are packed in quantities in a pot in a furnace. They should be heated gradually, kept at a bright heat for an hour and allowed to cool slowly. The substances used as a covering, in addition to fine coal dust or powdered charcoal, are cast-iron turnings, sodium carbonate or raw sugar. If only raw sugar is used, the quantity should not be too small.

A New Kutter Formula Diagram

The accompanying diagram for the Kutter formula is the result of several months' study to put this much used formula into compact convenient graphical form. In many computations of flow in the Mississippi, Missouri, and other rivers, states K. R. Kennison in *Engineering News*, this diagram has saved about 75% of the time used in making such computations by the only other Kutter diagrams which, as far as I know, are available.



The Kutter diagram prepared by Messrs. Rudolph Hering and John C. Trautwine, Jr., is complicated, but from it, after carefully flattening it out, one can with a straight edge find, when the other three are known, any one of the four variables R (hydraulic radius), S (slope), n (co-efficient of roughness), or C (the constant in the equation $V=C\sqrt{RS}$). Prof. I. P. Church has to some extent improved upon this by preparing a set of several diagrams, each for a different constant value of n, which eliminate the necessity of dealing with C and enable one to find, when the other two are known, any one of the three variables S, V or R. It is impracticable, however, to find n from the other three variables.

Other authors have arranged graphical solutions of this Kutter formula, but I know of none which, like the one here presented, puts upon one small sheet all the information which can be desired and enables one to find almost at a glance any one of the four variables V, S, R, or n when the other three are known.

In its present form this diagram could not be used, except approximately by extrapolation, when very low values of S (slope) are involved; but I believe from considerable experience in its use that its scope is amply adequate, particularly in problems where the flow is in rivers and other natural channels.

In connection with a notable power project now in process of construction, I have used this diagram in estimating back-flowage conditions in flows varying from 20,000 to 300,000 cu.ft. per second and with many varying pond levels.

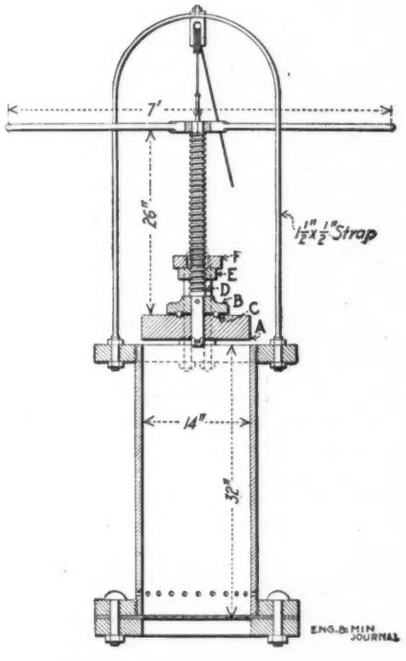
The Admiralty alloy, which is highly resistant to corrosion, is: Copper, 70: zinc, 29; and tin, 1 part.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Cleaning Oily Waste

At the Leadwood mill of the St. Joseph Lead Co. in the lead district of southeastern Missouri, Ross Blake, the superintendent, cleanses soiled engine waste with Oakite and obtains waste free from oil that he uses instead of colored waste which costs 6c. per lb. This waste, after it has been cleansed once and has again become soiled by oil, is cleansed a second time and a still dirtier product obtained which is used again, but only for the dirtiest work about the central station.



PRESS FOR CLEANED WASTE

The cost of cleansing, according to the results of treating the first batch of 1100 lb. of waste, is 2½c. per lb. Of this, 1.3c. is the cost of Oakite required per pound of waste cleansed, Oakite costing 11.3 per lb. There is therefore a considerable saving effected by this treatment of waste if the saving on waste alone be considered, but from 1100 lb. of waste 70 gal. of oil is obtained that is good enough to use for lubricating cars and other heavy machinery.

The apparatus required can be made cheaply. First it is necessary to provide iron receptacles for storing the waste. These are made by riveting a bottom and a cover of sheet iron to sections of old smoke-stack from 24 to 30 in. diameter. Two oil barrels are provided and one is fitted with a steam coil. In this barrel the waste is cleansed, and from it a pipe conveys the oil as it floats to the top of the Oakite solution over to the second barrel, where it is allowed to accumulate until a sufficient quantity has been recovered to make it worth while to cleanse it by rinsing with water. This can be done in another barrel. In cleansing the waste, Oakite and water are first put into the first barrel; then the oily waste is thrown in and steam is admitted to the coil. Gradually the oil is freed from the cotton fibers and rises to the surface of the solution. The oil is then floated over to the second barrel, the last of it being dipped out.

The cleansed waste is taken to a press, where as much water as possible is squeezed out before it is put on the shelves of the drying chambers heated by steam coils. These shelves are made of pieces of old screen tacked to a frame supported by the framework inside the drying box. In the accompanying drawing the construction of the press is shown. It can be made in any shop. A piece of 14-in. pipe about three feet long, is used. Flanges are screwed to the top and bottom. A few holes are bored in the sides of the pipe near the bottom to aid in draining the water as the waste is compressed. An iron plate ⅜ in. thick with a series of holes bored through it is put on as a bottom by bolting it between the bottom and another flange. The body of the press is bolted to a timber frame so that it will be held securely in place while the waste is being pressed. From the top flange of the pipe a strap-iron yoke is carried up to support a pulley, suspended from it by a stirrup attached to a swivel. This pulley is used to lift the head of the press out of the body after the waste has been pressed dry. The pressing device consists of the head-piece *A*, three inches thick, which makes a fairly tight fit with the body of the press; the foot-piece B, which together with the head, is recessed to take the balls *C* between the foot piece and the head plate; the screw *D* is 2 in. diameter and 26 in. long. To it the foot plate *B* is securely fastened, while the head piece is loosely secured to it swivel fashion. On the top end of the screw is a nut *E*, that fits under the yoke *F*. This yoke is fastened by U-bolts to the upper flange. The upper end of the screw is square so as to receive the double-hand wrench *G* by which the screw is turned and the waste compressed.

The Caldecott Sand Filter Table

The Caldecott sand filter table is one of the appliances used in connection with the Caldecott system of continuous sand collection. This table takes the place of the collecting vats that were formerly required in all cyanide plants on the Rand. The pulp issuing from the batteries undergoes a preliminary treatment in the Caldecott, diaphragm, cone classifier, in which a separation of sand from slime is made. The underflow, a thick sand containing from 26 to 30% moisture, is carried by a small additional stream of water through a launder and is discharged upon the sand filter table, where the water is removed prior to treatment by cyanide solution. One of the advantages of the table is that half an hour after the pulp leaves the battery, after having been crushed in water so as to enable flowing it over amalgamation plates, the excess water can be removed and the cyanidation of the pulp be started.

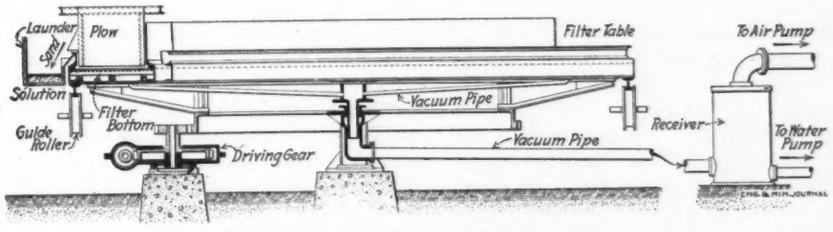


FIG. 1. CALDECOTT SAND FILTER TABLE

The underflow from the first diaphragm cone is led to a secondary cone or cones with the addition of sufficient water to enable the resultant pulp to flow readily through launders set at a grade of not less than 10%. The overflow of the secondary cones carries with it about 80% of the slime left in the underflow of the primary cone, so that a final product con-

taining about 1 to 1½% slime remains for treatment at the filter plant. As the efficiency and durability of the filter depends largely upon the freedom of the sand from slime, it will be seen that efficient working of the classification plants has a great effect on the results obtained by the system of continuous collection of sand.

The sand filter table consists, as shown in the accompanying illustration, of a central supporting cylinder, around the periphery of which is a launder in which is fitted a grating carrying a heavy filter cloth. This launder is capable of being revolved at a speed of one revolution every three minutes, it being mounted upon rollers, as shown, for that purpose. The bottom and sides of the launder must be air-tight, and should be well coated with bitumen, applied hot, after the usual calking has been done. The grating is made of strong screening, about 9 mesh, with No. 12 or 14 wire, and is supported by pieces of wood set radially on edge and beveled so as to reduce the filtering area as little as possible. On the grating is laid cocoanut matting bound at the edges and calked well into the sides of the launder. As cocoanut matting shrinks on becoming wet it must be cut to fit the launder and placed in position while moist, otherwise it will be liable to pull the calking away from the sides of the launder. A strip of jute about six inches wide should be placed between the matting and the grating at the outer and inner edges to render the filter less porous at these places. This is necessary to obtain an even flow of air through the filter, as the layer of pulp from the classifiers is usually thicker at the middle than at the sides. To prevent slime reaching the matting and choking it, strips of unbleached calico are cut to fit the launder and laid on the matting without being fastened.

The sand is removed from the revolving table by a stationary plow placed in a slanting direction across the launder, and made so that it may be raised or lowered a few inches when desired. Care must be taken, however, that it does not approach closer than ½ in. to the filter cloth, and that the variation in the distance between the filter cloth and the plow does not exceed ⅛ in. during a revolution of the table. The launder is attached to a center column on which it revolves, and is driven by gears actuated by a 5-hp. electric motor. The center column is hollow, and is connected to a receiver to which a vacuum pump is connected at its upper and a water pump to its lower portion. Pipes are placed to connect the bottom of the launder and the column so that the space between the bottom of the launder and the filter cloth may be partly exhausted as is shown in the accompanying illustration.

The pulp from the classifiers is distributed at a point about three feet behind the plow, so that the sand must make almost a complete revolution on the table before being removed. In actual working the plow is raised so as to leave a space of 1¼ in. between its lower edge and the filter cloths, and the table is put in motion. The pulp from the classifiers being directed on to the filter and the pumps started, the superfluous moisture is drawn through the filter to the receiver, from which the water pump returns it to the mill supply. The space between the plow and the filter cloths becomes filled with a bed of sand which forms the working bed and prevents slime being drawn into the matting. This bed, and the calico, must be renewed at least once every 24 hr. The operation is readily performed, and in actual practice takes less than an hour.

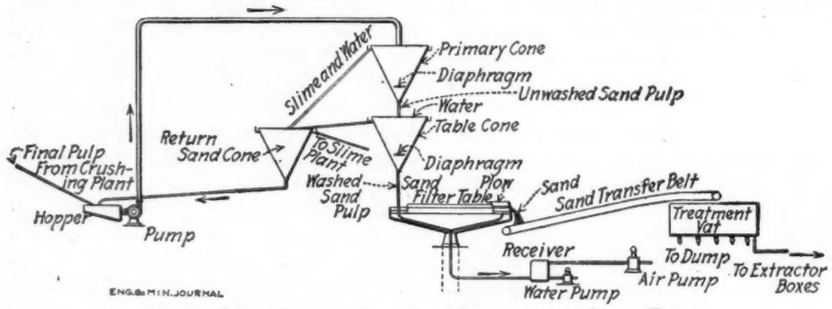


FIG. 2. FLOW SHEET, SHOWING POSITION OF SAND TABLE

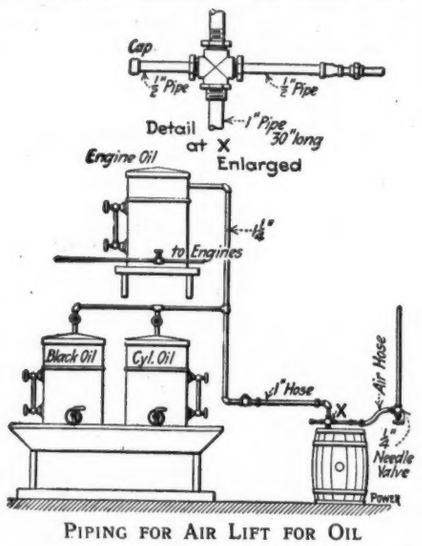
The vacuum, as shown by a reliable gage, must not be allowed to rise higher than about 10 in. of mercury. If this does occur, the working bed should be carefully raked, when the vacuum will drop once more to normal, provided the bed has not become choked with slime. A table of this type, 20 ft. in diameter with a 2½-ft. filtering bed, is capable of handling one ton per minute, and will regularly reduce the moisture in 800 tons of sand per 24 hr. from 30 to 12 or 14%.

The power required to drive a plant where two filters are used, handling about 1600 tons of sand per day, is about 69 hp., as follows: Two filter tables at 5 hp. each, 10 hp.; two water pumps at 2 hp. each, 6 hp.; one sand pump elevating 40 ft. 40 hp.; one pump supplying solution to gland of sand pumps, 3 hp.; a total of 69 hp. Separate receivers, vacuum, and water pumps, are required for each table installed, and should be arranged so that any receiver may be connected with any table, to permit repairs being made without stopping the plant. In the accompanying figure a diagrammatic scheme of how this filter table may be used in the treatment of sand is indicated by a section of a flow sheet.

These sand tables, each handling sand from over 2000 tons of ore per day or about 13% of the total Rand tonnage, are used at the Simmer Deep-Jupiter, Simmer & Jack; Cason (section of East Rand Proprietary Mines); Angelo (section of East Rand Proprietary Mines); and are to be installed at the Princess and at the City & Suburban mines.

Compressed Air Oil Lift

In a mill where compressed air is available and there is a considerable amount of oil or other liquids to be taken from barrels and transferred to tanks or other receptacles, the device shown in the accompanying illustration will make a useful adjunct to the engine room, states A. R. Munzer, in *Power*.



PIPING FOR AIR LIFT FOR OIL

It is simple in construction and can be made in a short time (with the exception of a special bushing, which requires lathe work) by anyone familiar with pipe tools. The sketch shows the construction plainly, also the method of using the device in a power plant.

Care should be taken not to open the air valve too suddenly, especially when pumping cylinder oil, which is generally heavy and hard to move. It is best to let the cylinder oil stand in a warm place for a day or two before attempting to pump it out. A ¾-in. needle-valve on the air line should be used, but an ordinary valve will do if the attendant is careful.

In 1911, 2650 ft. of churn drilling cost the Giroux Consolidated company $5628; this is an average cost of $2.12 per ft. A common contract price for similar work on the Cuyuna iron range in Minnesota is $3 per foot.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Esperanza Costs

At the Esperanza mine, El Oro, Mexico, the timber consumption, in 1911, amounted to 21.52 b.ft. per ton of ore (2240 lb.) compared with 35.49 b.ft. in 1910 and 43.33 b.ft. in 1909. The reduction in the use of timber in 1911 was the result of working narrower and harder orebodies as well as a more careful use of timber. These figures include all timber used in drifts, shafts, raises, winzes, squaresetting, lagging, bracing, wedging, stulls, and miscellaneous uses underground. All timber is handled on the surface by an electric yard locomotive.

The cost of operating per ton of ore, (2000 lb.) for 1911 was as follows: Development, 70c; ore breaking, $1.06; transporting from mine to mine bins, 30c; transporting from mine bins to mill bins, 5c; making a total cost of $2.11 per ton delivered at the mill. Milling cost was $1.52 per ton milled, making a total of $3.63 per ton for mining and milling. After the addition of indirect charges the total cost of production was $4.38 per ton of ore.

Costs on Gogebic Range

The Gogebic iron range is in the northern part of Michigan and Wisconsin, on the south shore of Lake Superior. The principal mines in Michigan, situated on this range, are near the towns of Ironwood, Bessemer and Wakefield. The deposits on the range reach depths of 1000 ft. or more and mining is carried on by underground methods. The ores occur in the Upper Huronian iron formation and are chiefly soft hematites though hard, slaty ores are abundant. According to various published reports there were 15,000,000 tons of ore shipped from the Gogebic range in Michigan in five years ended 1910, and practically the same amount mined.

The principal mines of this group were the Ashland, of the Cleveland-Cliffs company; the Norrie, Aurora, Tilden, Puritan and the Chicago, belonging to the Oliver Iron Mining Co., a part of the U. S. Steel Corporation; the Newport, Anvil and Palms, owned by the Newport Mining Co.; the Ironton and Colby, of Corrigan, McKinney & Co.; the Yale, of the Lake Superior Iron & Chemical Co.; the Eureka and Castile, owned by the Castile Mining Co.; the Brotherton, of the Brotherton Iron Mining Co.; and the Mikado, of the Verona Mining Company.

Basing the value of the ore at 100%, the cost of mining and delivering the ore from this district to the lower Lake ports is approximately as follows: Mining, 32.2% of the total value; exploration and development, 2.3%; construction, shafts, machinery, etc., not charged direct to mining, 3.92%; general expenses, including administration, 2.36%; royalties, 9.1%; taxes, 1.51%; rail freights, 9.15%; Lake freights, 16%, and commissions, 1.06%; making the total cost about 77.7% of the total value of the ore. Owing to a change in the method of taxation in Michigan, taxes will probaby be much higher in the future than shown by these figures.

Costs at the Bluebell Mine

The Bluebell mine is situated on the east side of Kootenay Lake, British Columbia. Wage rates are as follows: Foremen, $5 to $6 for 8 hr.; shift-bosses, $4 to $4.50 for 8 hr.; machine miners and helpers, $3.50; hand miners, $3.25; mill hands, $3 to $4; smiths and helpers, $3.50 to $4 for 9 hr.; compressor runners, $4 for 8 hr.; muckers, $3 for 8 hr.; outside laborers, $3 for 9 hr.; carpenters and machinists, 50c. per hr.; average wage for all classes, $0.433 per hour.

The ore is all mined by adit and stoping, so there are no pumping and hoisting charges. There is but little timbering, but a good deal of shoveling and wheeling. Power is furnished by a 700-ft. head of water. Ore is hauled in trains of five 16-ft. cars by horses, except rarely, when a car is taken out by hand at night. The normal crew consists of a foreman and shift boss, 2; timberman, 1; driver, 1; miners, 14; muckers, 15; total, 33.

The total costs, as shown in the accompanying table, are $0.984 per ton extracted (calculated on 43,069 tons mined and 200 ft. of dead work), and may be roughly divided as follows: Breaking, $0.647; mucking, $0.272; haulage, $0.033; timbering, $0.032.

COSTS AT BLUE BELL MINE

	Labor $ per Ton	Supplies $ per Ton	Total $ per Ton
Foremen and bosses	0.055	.....	.....
Timberman and nipper	0.042	.....	.....
Miners	0.299	.....	.....
Muckers and loaders	0.235	.....	.....
Driver	0.019	.....	0.650
Dynamite, fuse, caps	.....	0.147	
Candles	.....	0.013	
Drill points and steel	.....	0.014	
Miscellaneous	.....	0.019	0.193
Power and light (no depreciation)	0.067	0.011	0.078
Shopwork (proportional part)	0.055	0.008	0.063
	0.772	0.212	0.984

Note—Abstracted from a paper by S. S. Fowler in the "Quarterly Bulletin" of the Canadian Mining Institute, February, 1912, "Costs and Cost-Conditions at the Bluebell Mine."

U. S. Iron and Steel Works

The figures published in the 13th census of the United States, show that there were 446 iron and steel works and rolling-mill establishments in 1909, compared with 415 in 1904; in 1909, 95.1% of the total were operated by corporations, producing 99.5% of the products, against 98.9% of the total products by corporation-owned concerns in 1904, when their holdings represented 92.8% of the establishments. Of all concerns reporting, 41.7% had an output of products amounting to $1,000,000 and over in 1909, while in 1904 only 31.6% were so rated.

The total cost of iron and steel material was reported as $657,500,856, and the total value of the products at $985,722,534. Material produced and purchased amounted to 38,558,359 tons, of which 7,846,462 tons were produced in the works of the concern reporting; 19,270,763 tons transferred from other works of the companies; 11,441,134 tons purchased. This material consisted mainly of 18,712,304 tons of pig iron; 9,929,710 tons of scrap; 6,508,249 tons of ingots, blooms, billets, slabs, muck, scrap bar, etc., and the remainder of ferro-alloys, skelp and wire rods.

Products sold and consumed amounted to 98,937,886 tons; 81,480,801 tons were for consumption in the works of the companies; 4,995,281 tons transferred to other works; 12,461,804 tons were produced for sale. The total products were composed chiefly of 22,968,862 tons of steel ingots, of which only 30,444 tons were for sale; 22,826,117 tons were consumed in the works of the company, and 112,301 tons transferred to other works. Blooms, billets and slabs produced amounted to 16,263,418 tons; 1,841,819 tons were sold, 3,045,977 tons transferred to other works and the remainder consumed at the works of the reporting company. Openhearth, basic and bessemer steel were next in the list in the order named, the production being 13,725,783 tons, 12,952,840 tons and 9,145,542 tons, respectively. The production of scrap amounted to 6,364,647 tons. Of the products sold, bars and rods, 3,151,569 tons, represented the largest tonnage with plates and sheets next, 2,807,114 tons.

There were 260,762 persons engaged in the industry; 47 were proprietors or firm members, 779 salaried officials of corporations, 3460 superintendents and managers, 16,400 clerks and 240,076 wage earners. Proprietors, officials, superintendents and managers represented 1.6% of the persons engaged; clerks, 6.3%, and wage earners, 92.1%, of whom 99.1% were males, 0.4% females and 0.5% were under 16 years of age. The total power reported as used by all concerns was 2,100,978 hp. The expense of production was composed of 2.9% for salaries, 18.3% for wages, 73.9% for materials and 4.8% for miscellaneous expense.

Nundydroog Mines, India

In 1911 the Nundydroog mines, Oorgaum, South India, employed 4294 persons and mined 155,962 tons of ore which indicates an average of 36.2 tons of ore per year per employee, including those engaged in development, milling and miscellaneous work. Underground, 2544 men were employed, which shows that 61 tons of ore and 4.7 ft. of development work are secured per year per man employed underground. The total development work performed was 12,096 ft., consisting of 67% drifting and crosscutting. 22% raises and winzes, 5% for ore bins, and 6% shaft sinking. The development work performed is equal to 1 ft. for every 12.8 tons of ore produced. During the year an average of 35.51 machine drills were operated underground, 34.19 being used in development and 1.32 in stoping. No data are given in the annual report in regard to the percentage of the ore mined or the development work performed by machine drills.

Of the ore sent from the mine to the mill 11.3% was discarded by hand sorting. In the mill 82.7% extraction is made by amalgamation and the average mercury loss was 2.59 drachms per ton of ore. The cyanide plant makes a 53.12% extraction, consuming 0.561 lb. of cyanide, 0.072 lb. of zinc, and 0.143 lb. of caustic soda per ton of ore treated. The mill worked during the year with an average of 82 heads and crushed 3.59 tons per day per stamp, the falling weight of each head being 850 lb. and using Nos. 6 and 7 needle-punched copper screen.

The company erected 33 new coolie huts during 1911, bringing the total number owned by the company up to 1375 huts. The employees consisted of 143 Europeans and Eurasians; 2544 natives working underground: 1579 working as hand laborers and contractors, 472 as timbermen and assistants, and the remainder in general occupations; 1607 natives on surface, 232 of whom were employed as engineers, fitters and boilersmiths, 107 as engine drivers and firemen, 73 as blacksmiths, 109 as carpenters, and the remainder in handling sand and slime, mill work and general surface labor. Of the natives employed on surface, 390 were females, 111 tramming quartz and cleaning sand from slime pits, 40 charging and discharging cyanide vats, 207 as laborers, including building and excavating, and 32 as sweepers. The total cost of production, including all expenses, was $4.40 per ton of 2000 lb. of ore as mined or $6.66 per ton of sorted ore. The net yield was 15 dwt. 14 grains of fine gold per ton of ore.

Machine Drilling in Alaska

The 1911 records of drilling at the Alaska United and the Alaska Mexican, adjoining properties to the Alaska Treadwell, as shown in the annual reports, are given herewith for comparison with the 1911 record of the Alaska Treadwell. The latter figures were published in the JOURNAL, Apr. 13, 1912. Labor cost $3.50 for machine drillers and $3.25 for helpers.

	Alaska Ready Bullion Claim	United 700-ft. Claim	Alaska Mexican	Alaska Treadwell
Footage drilled during year	266,172	249,622	367,712	920,545
Tonnage broken	252,701	210,350	340,536	1,021,765
Footage drilled per ton broken	0.95	0.82	0.93	0.90
Average machine shifts per day in ore	10.24	10.49	14.65	39.28
Average machine shifts per day in waste	1.05	0.06	2.20	4.59
Average machine shifts per day, total	11.29	10.55	16.85	43.87
Average tons broken per machine shift	32.5	27.4	27.8	32.74
Average footage drilled per machine shift	34.2	33.2	30.1	29.42
Cost per machine shift:				
Labor	$8.59	$7.36	$7.55	$6.86
Explosives	2.88	2.68	2.34	2.62
Supplies, power, repairs, etc	5.38	5.85	4.62	4.02
Total cost per machine shift	$16.85	$15.89	$14.51	$13.50
Rate of drilling per machine shift, feet:				
Stoping	32.71	28.58	28.58	31.05*
Cutting out	34.91	33.90	31.32	38.45*
Development	35.57	41.26	34.78	32.92*
Average tons broken per machine shift:				
Stoping	57.70	40.67	36.25	39.04*
Cutting out	16.94	15.94	13.95	16.30*
Development	8.64	7.04	8.01	8.90*
Tonnage broken per foot drilled:				
Stoping	1.764	1.42	1.26	.....
Cutting out	0.485	0.47	0.45	.....
Development	0.242	0.17	0.23	.....
Average number of machines employed:				
Stoping	4.85	5.92	11.28	.....
Cutting out	3.66	1.54	2.54	.....
Development	2.78	3.09	3.03	.....

*Approximately.

Zinc Mining Costs

An engineer's report of a certain zinc mine in southwest Missouri shows the following costs: 48,000 tons of ore, yielding 2.15% blende and 1.3% lead concentrates after culling, cost 9c. per ton of rock for pumping, 76c. for mining, 22c. for milling and 5c. for miscellaneous charges, making a total of $1.12 per ton of rock or $32.44 per ton of material. A record of 136,000 tons averaging 1.78% yield in blende and 1.04% in lead concentrates, after culling cost 97c. per ton of rock, consisting of 4c. for pumping, 67c. for mining, 22c. for milling and 4c. for general expenses or $31.70 per ton of mineral. A four-year record at one shaft shows that of 305,000 tons of rock mined 5% was discarded by culling, the waste ranging from 9% for the first year to 2½% for the last year. A three-year record at another shaft of the same company shows a regular average of 2½% of the rock hoisted as discarded by culling.

Ahmeek Production Costs

According to the 1911 annual report of the Ahmeek Mining Co. in the Lake Superior copper district, the cost of producing copper was 7.17c. per lb., a reduction of 3.88c. from 1910 costs. The apparent reason for the lower cost of 1911 compared with 1910 is the increase yield of ore in pounds of copper, and the small amount of construction work for 1911; as only $48,822 was expended against $219,405 in 1910, a difference of 1.53c. per lb. of copper. The cost of mining, transportation to the mill and taxes was the same, $1.42 per ton stamped, for the two years; but the yield in copper for 1911 was 25.41 lb. compared with 22.3 lb. in 1910; making a difference of 2.32c. per lb. of copper, although the cost per ton of rock was the same. The cost of interest was reduced 0.06c. per lb. and the cost of smelting, freight, commissions, etc., increased 0.03c. The cost per pound of refined copper for 1911 was as follows: Cost at the mine and mill, including 11,691 ft. of development, 5.61c.; construction 0.32c.; smelting, freight, commissions, etc., 1.19c.; and interest 0.05c. In 1910, 6.8% of the ore hoisted was discarded by sorting and in 1911, 3%. The increased yield of rock in copper was partly due to a closer saving by the mill.

Company Promotion in London

By William Hillman

The man from the West attempting to float a mine in London finds the promoter a necessary factor in all company promotions. Because of the consequences in case of failure the promoter demands and gets what seems to be an exorbitant fee. Irresponsible promoting syndicates nullify the protection of the British company law.

In spite of the great and growing importance of New York as a money center and even admitting that the "Money Trust" is there developed to its greatest extent, London is still preëminent in finance and it is to her financiers that the eyes of all who desire capital are turned. Although many Americans are thoroughly familiar with London financial methods, I believe those who are contemplating financing their enterprises in London will find the following notes of interest.

It is my object in this article to give an account of the usual method of raising money in London for public companies of moderate capitalization, say up to £500,000, and to point out some of the difficulties that an American vendor is likely to encounter. I also wish to show that in spite of its high reputation English company law does not afford adequate protection to the investor, and to indicate how some of these defects might be remedied.

Where the Promoter is Essential

About the first fact that strikes an American who attempts to sell properties in London is that as a rule there is no chance to sell to a group of private investors and that he must depend upon having his property handled by means of a public company; i.e. a joint stock company formed in accordance with a special body of laws, and offering its shares to the general public, usually by medium of a prospectus that is published as an advertisement in the leading newspapers, and is also distributed to individual investors through the mails.

These public companies are formed and their initial expenses are borne by promoters, and hence the chief requisite for doing business is "first catch your promoter." This is an extremely difficult task, for strange as it may seem, the promoter is a shy bird, and his name does not often appear in connection with the companies that he promotes. Though there are directories of directors, and all sorts of classified lists of investors and shareholders, there is no list or directory of London promoters. This retiring disposition of prominent men is quite a feature of London life and is carried to such an extent that some prominent bankers and capitalists do not have their names appear in the directory or in the telephone book.

It is probable that any American visiting London will have letters of introduction to leading engineers and capitalists, and it is equally probable that he will be disappointed when he attempts to do business with any of these people. He will find them so occupied with their own affairs and his interviews so full of depressing interruptions that he will not have a fair chance of stating his own case; the most that he can hope for is to be allowed to leave his maps and reports and to accept a promise that they will be carefully examined. Sometimes the reports are opened and read, but not always.

The Glad Hand Is Not Extended

A typical interview might be somewhat as follows: A long delay in a gloomy cupboard is ended by an invitation into an inner sanctuary by a stolid commissionaire, whose breast shines with medals won in African or Oriental campaigns. Hardly do you state your business when your host tells you that he has already had your proposal placed before him, or at any rate a similar one. He regrets that he cannot entertain it at present. You scarcely get a chance to utter three consecutive sentences before he is interrupted by the telephone, and you soon learn that you are talking with a man whose mind is too full of absorbing business to contain any new ideas. He is sure to have a deal of some sort on in the part of the world which is financially fashionable, whether it be West Africa, the Malay States, or, as recently, Nigeria. To him all other parts of the earth are non-existent. "Now if you only had a tin concession in Nigeria I could handle it in a minute. It is so difficult to get anything good there. I am just promoting a property with a capital of £1,000,000 and I cannot handle anything else until this is out of the way." Brr! Brr! goes the 'phone. "Yes, you must get on to him at once, for if he gets away I don't believe we can handle the deal." Then follows a long 'phone conversation, probably touching on golf before it ends. Eventually he turns to you and says in a confidential manner: "You heard this deal I was just talking about on the 'phone. It 's practically all settled, and the shares are certain to be oversubscribed. Possibly I could get some underwriting for you if you feel like taking some." And before you know where you are, you will find yourself listening to the details of the promoter's scheme, and all chances of discussing your own proposal vanish. This effective method of getting rid of a visitor who seems likely to prove unprofitable, by leading the conversation to the promoter's own affairs, is so common that I have sometimes thought that it must be laid down somewhere in a "Manual for Promoters."

An intimate acquaintance with busy promoters has convinced me that it is practically useless to try to sell a mine or other property through them, and it is the busy promoter that the American coming to London is likely to meet. It seems, therefore, that his best chance is to get in touch with promoters who are not so busy. These men are equally hard to find, and are usually only to be reached through intermediaries who expect a large slice of profits for their introductions.

Pitfalls for the Unwary

Here it seems appropriate to caution the American who is unfamiliar with London methods against giving commission notes or writing letters that can in any way be interpreted as giving anyone a claim on his property. The spirit of Dick Turpin is still stirring, and it is marvelous on what a slender basis of fact the commission hunter works. A stranger to London wiles should at once put himself in charge of an experienced solicitor as soon as he begins serious negotiations.

When a promoter is found who will undertake your business he is sure to want nearly all the rest of your profits—there are, of course, exceptions—and the more successful the promoter, the bigger the slice he takes. I know of one case where the promoter made about £60,000 on a deal and gave the unfortunate option-holder nothing except a call on some ordinary shares; a call which soon became worthless. In this particular deal a property for which about £1800 was paid in cash was sold to the public on a basis of £130,000. No set rule can be given as to the amount of profits that a promoter requires, but a common formula among them closely resembles the problem set for Alice by the White Queen: "What's one and one and one and one and one and one and one and one and one and one?" The promoter's formula is: "One and one and one." This expression translated is: one part for purchase price, one part for working capital and one part for promoter's profits. I do not know of any deal that has been put through exactly on this basis, but it is an ideal toward which a number of promoters work.

After the promoter has been found and an agreement reached with him the business of the American is ended, for he can be of little use in the turmoil of a pro-

motion. However it seems worth while to give some details of the actual promotion for there is as far as I know but little written on the subject.

An Example of Company Promotion

As I have remarked before, the promoter raises the money needed for his schemes by selling shares to the general public; his methods can probably be best understood by a concrete example. I give here, with some modifications, the details of a promotion with which I am familiar. The property in question, call it the Marianne mine, was first offered for £100,000, but long negotiation convinced the owner that all cash was not to be had and he finally sold for £40,000 cash, and £60,000 in shares. As soon as negotiations were well under way the promoter formed the Maryan Syndicate, Ltd., capital £200 in 4000 one-shiling shares. This syndicate was formed to facilitate the handling of the promotion and also to protect the promoter from any claims that might in future be raised by irate shareholders in case the promises of the prospectus were not fulfilled. The promoter's name did not appear in connection with the formation of the syndicate, the original subscribers being three of his solicitor's clerks, whose average pay was £3 per week, and whose total belongings would not aggregate £100 —yet the law considered these men of straw good enough to become responsible to the public for transactions involving about £200,000. Men who are anxious to find out who are the promoters in any particular case can best do so by investigating the original subscribers of the promotion syndicate, full details will be given by Somerset House, the record office for London companies.

All the contracts with the vendors, brokers and underwriters were made by the Maryan Syndicate, and the syndicate transferred the property to the Marianne Mining Co., Ltd., which had been formed with a capital of £200,000. Owing to the well drawn prospectus, based on the reports of a prominent expert, and to well chosen chairman and directors, backed by the efforts of strong underwriters, aided by a good press, and, most important of all, owing to the region where the mine was situated, being in fashion at the moment, the promotion went off swimmingly and the shares were oversubscribed. The final results of the promotion, omitting details, were £110,000 in cash received from sale of shares, which was distributed as follows: Cost of property, £40,000; working capital, £30,000; promotion expenses, £15,000; promoter's profits, £25,000; or a total of £110,000 cash received, and shares to owner of property, £60,000; shares in reserve, £30,000, so that the total capital of the Marianne Mining Co., Ltd., is £200,000. The promotion expenses in detail were: Legal fees and expenses of formation of company, £1000; printing and postage of 30,000 prospectuses, £500; advertising prospectus, £3200; expert's fee and cables, £1000; broker's fee for allowing use of name on front page, £500; underwriting £110,000 at 8%, £8800; or a total of £15,000 for promotion expenses.

Mailing Prospectuses a Business

The 30,000 prospectuses were mailed to possible investors by a firm that makes a specialty of this work and has a large staff of clerks and classified lists of shareholders covering all Great Britain. The advertising was the publishing of the prospectus in about fifty prominent newspapers, the price ranging from £125 for a single isue in the *Daily Mail* down to £10 for a provincial paper. At the foot of each advertisement was printed a form for application for shares, and it was on these forms that most of the applications were made; few subscriptions resulted from the prospectuses that were sent out by post.

The underwriting, 8% on the cash received or £8800, was a heavy expense, and in this case it was extremely profitable to the underwriters, for as they had, in accordance with their underwriting contracts, to pay in but 10% of the amount underwritten, and as they received this amount together with their underwriting commission within 10 days, they made a profit on the money employed at the rate of 8% per day or over 2500% per annum. It is almost needless to remark that underwriting is not always so profitable. The great utility of the underwriter is as an advertiser and boomer of shares. It is for this reason that nearly all companies have their shares underwritten, though in many cases the expense is probably unnecessary.

The Hazards of Being a Promoter

The promoter's profit, in this case £25,000, seems excessive to the outsider, but it is usually divided among a number of people and to one who is familiar with the proceedings of the London bankruptcy courts the profits do not seem so attractive, for the way of the promoter often leads to failure. While the promoter can cover himself for most of his risks, he is bound to advance several thousand pounds for legal costs, expert's fees, cables and printing, on every business that he takes up and if he goes so far as to advertise his outlay will not be less than £5000 on any company that he forms. In case the public does not subscribe for his shares much of his loss is paid by the underwriters, but after his underwriters have been "stuck" once he finds it most difficult to get any new company underwritten. As a result he takes more chances and does his own underwriting, and often lands in bankruptcy. I know of several cases where the promotion expenses have run into thousands of pounds and the amount of shares subscribed for has been merely nominal; in case of a Rhodesian mine the promotion expenses were £5000, and £23 the amount of the shares subscribed.

It will be seen from the foregoing that this cumbersome method of raising money inevitably overcapitalizes the enterprise. Take the case of the Marianne mine, above mentioned; the mine worth £100,000 needed £30,000 working capital and would pay a profit on this, but now being saddled with £200,000 capital and an expensive and incompetent organization, has but a poor chance of success.

Not all companies are failures, and it is to be remembered that the promoter does much useful work in gathering capital from thousands of persons and enabling profitable enterprises to be established. Under the present constitution of society there seems to be no way by which the promoter's services can be dispensed with, and accordingly he will be able to levy his heavy tax on industry for a long time to come. However, the promoter does not set out to serve the public; his chief aim is to make profits, and an almost equally prominent aim is to avoid getting entangled in the meshes of the law. This is at times an expensive proceeding and promoters and vendors have been obliged to refund large sums. One of the most recent cases is that of the Kern River Oil Co., where a large sum of money was repaid by the vendors, and I know of another case where a promoter had to pay £176,000 in damages.

Irresponsibility of the Flotation Syndicate

It was to avoid such consequences that the irresponsible Maryan Syndicate was formed. By working through these irresponsible syndicates the promoter is insured against any claims of shareholders from irregularities in the purchase and transfer of the property, and for any mis-statements in the prospectus the promoter protects himself by his expert's reports in the first instance, and then throws the onus of the prospectus on the directors of the public company, in this case the Marianne Mining Co., Ltd. The directors shelter themselves behind the expert's report under the advice of solicitors and counsel.

The Maryan Syndicate, Ltd., was a private company, for it did not ask the public to subscribe to its shares, and had a capital of only £200, and this was the maximum amount that could be recovered from its shareholders. But, as a matter of fact, this £200 was never paid into the treasury of the syndicate, and its shareholders were not worth even

that small amount. Therefore, the loss that could come to the promoter through the operations of the syndicate would be nominal.

Prospectus Cautiously Prepared

The greatest risk run by the promoter is in the preparation of the prospectus, for should any shareholder be able to prove that he had been misled by it he would have a good chance to recover his money from the directors, and they in turn would look to the promoter, so there is a possibility of heavy loss should any glaring mis-statements be found in the prospectus. Hence, the preparation of a prospectus is a delicate piece of work and only those on the "inside" have any conception of the vast amount of thought and consultation expended on a well written prospectus. It is first drawn up in a general way by an experienced prospectus writer, who well knows the safe path between glowing fancy and dull fact. His draft passes the scrutiny of the promoter's solicitor and finally a counsellor of note is called on to revise the finished work.

After all it is not the writing of the prospectus that gives the promoter the most trouble, but it is the selection of the men whose names are to adorn the "front page" in bold-face type. These important names are those of the chairman, directors, brokers, bankers, solicitors, auditors and secretaries; the names of the engineers are usually not considered of enough importance to mention.

Notables and Nobles Desired As Directors

It is in the selection of the chairman and the directors that the promoter shows his capabilities, and the task requires a wide acquaintance, tact, influence and liberality. These are the men to whom the investor looks for a "square deal"; their names are what he first sees, and they have more weight with him than all the rest of the prospectus. Accordingly they must be men in whom the public has confidence, and yet they must not pry too deeply into the mysteries of the promoter's profits and the origin of the reports on which the prospectus is based. The chairman should have a title, for in spite of the failure of many members of the nobility to protect the interests of their shareholders "Sirs" and "Lords" are still of value in the city of London. From the promoters standpoint, an ex-army officer, or a retired government official is an excellent chairman. Some of the directors should have a practical knowledge of the business that is being promoted.

The anxiety of the promoter to guard against consequences is easily accounted for by the well known high death rate among public companies. It does not seem worth while to prove this mortality, but the results of the West African boom are interesting. In 1901, 260 companies were formed and only 20 were alive in 1911, and of these only five or six have paid dividends and only one has done really well. The records of the West Australian boom are even worse.

In view of the great risk of a failure and of the subsequent attacks by angry shareholders, it is a mystery why so many men of high social position and large fortunes are induced to lend their names to support a business of which they know little or nothing and which is foredoomed to failure from the start. A startling instance was the acceptance by Earl Dufferin of chairmanship of Whitaker Wright's companies. A more modern instance is shown by the appearance of the names of Cornelius Vanderbilt and Robert Goelet as directors of the United Malaysian Rubber Co., floated in London in April, 1910. In the opinion of prominent rubber experts, as stated at the time, the company never had the slightest chance of success, and the fact that instead of an estimated profit of £160,000 a loss of over £40,000 was incurred up to May 31, 1911, seems to show that the experts were correct. This case seems even more mysterious than usual for it is admitted that neither of the above gentlemen made any money from the promotion.

Now it is unquestionably the case that when a man buys shares on the strength of a publicly advertised prospectus backed by well known men, he expects to have a fair run for his money, and it is equally unquestionable that in 90% of the companies promoted during a boom he never has a chance of seeing his money again. The companies are formed and the shares issued under the protection of the law, and I hold that if the law was properly drawn up and administered a large proportion of the failures could be avoided. There would still be large sums of money spent unprofitably, but the risks run would be incurred knowingly, and investors would not be hoodwinked as at present.

Investor Has No Chance To Judge Expert's Report

It is not within the scope of this article to criticize the English company law in detail, but there are two points that seem important enough to discuss, and which should be of as much importance in America as in London. One of the great defects of the present methods of issuing prospectuses is that no chance is given to the investor to properly judge of the expert's report. A requirement that every prospectus should contain a description of the expert's qualifications, the amount of his fee and how it was paid and the name of the payer, the date and duration of his examination would materially aid an investor in judging of the value of the report. These requirements would certainly interfere with the present practice of having reports made by men who know nothing of the business on which they report, or who report on properties that they have not seen for years, or possibly have never visited.

Irresponsible Promotion Syndicates

Another defect in the present methods is the lack of control over the promoting syndicates. The intent of the law is that the promotion of public stock companies should be carried on in such a way that the private investor should have full notice of all contracts made and of the prices paid for the property that he is buying, and also that these statements should be made by some responsible authority so that the shareholder should have redress in case of mis-statements. But the invention of the irresponsible syndicate has taken away all chance of recovery of damages suffered by the investor. It would seem as if the interests of the shareholders would be much better served if every promotion of a public company were required to be carried on by men of substance instead of men of straw, and if carried on by a syndicate the actual paid-in capital of the syndicate should bear some reasonable proportion to the capital of the company which is being promoted.

Australian Production in 1910

The statistics of the mineral production of the Commonwealth of Australia and Northern Territory for 1910 are as follows, the items being ranged in order of descending value: Gold, 2,720,005 oz.; coal, 9,759,004 tons; copper, 51,080 tons; silver-lead ore, 369,196 tons; zinc, 468,639 tons; tin ore, 14,427 tons; silver, 2,836,304 oz.; pig lead, 23,607 tons; coke, 282,337 tons; wolfram ore, 1189; pig iron, 40,487 tons; opal, £69,200 worth; limestone flux, 203,157 tons; iron flux, 38,796 tons; shale, 68,657 tons; salt, 54,000 tons (exclusive of Victoria); unspecified gems, £24,081; iron oxide, 47,551 tons; bismuth, 72 tons; molybdenite, 154 tons; scheelite, 154 tons; gypsum, 17,046 tons; and antimony, diatomaceous earth, manganese, platinum, alunite, and kaolin, all under £8000 each.

Western Australia furnishes 54% of the gold; New South Wales 84% of the coal, 63% of the silver, and all of the zinc.

After numerous attempts to find potash in Baden, says the *Daily Cons. and Trade Reports*, of May 13, 1912, a deposit 13 ft. thick, lying 2322 ft. deep, has been discovered near Mullheim.

Stock Companies and Townsites on the Iron Ranges

SPECIAL CORRESPONDENCE

Incident to the successful development of the Cuyuna iron district and the revival of interest in exploration in the older iron districts of Minnesota, a number of companies have sought to secure the necessary money for their operations by public sale of stock. This is a feature which has been practically absent from the financial side of the important operations in the iron region, since the boom incident to the Mesabi in the early '90s. The large part of all operations has been carried on by strong corporations or close syndicates identified with the iron industry. Often personal acquaintances were asked to help provide the funds required for exploration and development, but ordinarily there was no open or systematic solicitation of the public's money, as in the case of mining undertakings in other metals and in other districts. The first stock companies operating in the Minnesota region in recent years were identified with the Vermilion Range. In fact, it must be recognized that these companies had something to do with the revival that has made them thrive.

These Vermilion stock companies have not all been failures, but there are several cases of poor and extravagant judgment in the conduct of the operations, and there is talk, locally, that some of the companies did not put all of the money received from the public into real development. Some buoyant prospectuses were issued and conditions were presented that the experienced operators say "never wuz." A little iron in the ground was made to do a large duty in the reports for public consumption. One promotion carelessly announced that "a vein of gold ore, assaying $90 to the ton and of large tonnage" had been encountered, and that after the iron had been developed, it was intended to operate this "gold" mine. The facts of this "gold" find were never made public, but it would appear to an outsider that the real "gold mine" in such a case was the public. The Cuyuna district, with its unexpected development, has now a number of stock-selling companies. It would be unfair to criticize them all, and inadvisable to decry any of them on grounds concerning the possibilities of finding ore in the large, unexplored area of the district. But the fact remains that exploration and misrepresentation are almost inevitable in these campaigns for the public's money and the actual developers and operators in the iron districts are not pleased to see such features intruded into the business which has heretofore been free from anything like fraud or jobbery, as far as the public is concerned.

Another feature incident to the rapid progress of the Cuyuna district has been the multiplication of townsite projects and the sale of lots at boom prices to prospective residents and to speculators. The example of the prosperous and permanent cities and towns which have sprung up in the Mesabi district is the strong argument in these promotions. But here again caution is necessary in the interests of the public and the good repute of the iron business. Out West the great question in connection with each new camp is that of permanency. Some of the towns will be permanent and some will not; others, too, may have to migrate bodily, as did some of the early Mesabi towns, when ore was found under them.

The stock companies and the town-site speculations are not in accord with the serious, substantial and sound nature of the iron-mining business in the Lake Superior region and those who are most closely identified with the business would like to see the practices discontinued, or at least confined to the straight and narrow path of financial rectitude and soundness.

Gold Mining in Formosa

Gold mining in Formosa is no new thing, says Consul S. C. Reat, of Tamsui, Formosa (*Daily Cons. and Trade Reports*, Apr. 29, 1912), as it dates back to the Chinese régime. In 1890, when Liu Ming Chuan was carrying forward the first railroad construction, Chinese coolies found gold while excavating for the foundation of a railroad bridge over the Keelung River at Shichito, and no subsequent prospecting has shown any mines outside of the Keelung River watershed.

Both placer and quartz mines were operated for several years, but placer mining has been virtually abandoned. There are three quartz mines being worked. These mines are situated in north Formosa, within 10 or 12 miles of Keelung, the chief port of Formosa. They are called Botan-ko Kozan, Kinkwaseki Kosan, and Zuiho Kozan, the address of each being Keelung, Formosa.

The Botan-ko consists of 600 acres, and has been operated since 1903. In its equipment are six Huntington mills; six gravity stamps, 1000 lb. each; 20 small stamps; and 13 motors. The system is amalgamation, concentration, and cyaniding by sand percolation, and slime treatment.

This mine smelts its own concentrates. This is a gold ore with a small amount of silver. It also contains about 0.6% of copper. There is a great deal of ore worth about $2.50 and some worth $5 per ton, and the company is planning to treat 200 to 400 tons per day. At present about 100 tons a day are being treated. The Botan-ko mine should run for several years. Hydro-electric power is used.

The Kinkwaseki mine comprises 2246 acres. The general equipment is not unlike the Botan-ko, except that there are 80 light stamps. The ore is not highly siliceous. There is here a cyaniding ore also, and about 100 tons are treated daily. The company intends to increase the capacity of its plant. The power is hydro-electric.

The Zuiho mine comprises 2046 acres. In its equipment are nine Huntington mills. The same process of cyaniding, sand and slime, is used here. This mine sells its concentrates to the Kinkwaseki. The ore consists of two classes—oxidized and sulphide. They are eventually treated together. The amount of ore treated daily is about 85 tons, with a value of $6 per ton. This mine is now a small producer and is on the decline. Power is derived from electricity generated by steam.

The accompanying table shows the production of the mines from 1906 to 1910, being the last statistics available.

FORMOSAN GOLD PRODUCTION

Year	Botan-ko	Kinkwaseki	Zuiho	Total
1906	$318,324	$346,462	$243,369	$908,155
1907	275,785	301,796	220,542	798,123
1908	191,535	694,859	186,707	1,073,101
1909	176,202	709,890	166,964	1,053,056
1910	134,147	693,947	231,895	1,059,989
Total	$1,095,993	$2,746,954	$1,049,477	$4,892,424

Missouri Zinc Production in 1911

The total output of zinc concentrate in Missouri for 1911 was 217,812 tons of sphalerite and 20,119 of silicate and carbonate. The zinc content, allowing for smelting losses, is estimated at 122,515 tons, according to the U. S. Geological Survey. The total crude ore produced from soft-ground workings was 3,217,166 tons, which contained 2.3% of zinc and 0.3% of lead, corresponding to a percentage of 4.1% of zinc concentrate and 0.4% of lead concentrate in the original ore. The average lead content of all classes of soft-ground galena concentrates was 79.9%; of lead-carbonate concentrates was 54.7%. The average zinc content of all soft-ground sphalerite concentrates was 58.9%; and of silicates and carbonates was 40.4%.

The total crude ore from sheet-ground workings in 1911 was 4,944,910 tons as compared with 5,779,192 tons in 1910, carrying an average zinc content of 1.24%, and a lead content of 0.4%. The average galena concentrates produced carried 79.8% lead and the sphalerite concentrates carried 58.6% zinc.

Benoni Mine and Mill on the Rand

By H. S. Gieser *

Two of the three reefs encountered are being stoped. The ore, from which 18.5% of waste is sorted, is reduced by Blake-Marsden crushers, a 55-stamp battery and four tube mills, the crushing capacity being 20,000 tons per month. After plate amalgamation the pulp is classified and the sand cyanided in Way-Arbuckle tanks arranged for continuous agitation; the slime is stored for future treatment, the Arbuckle cones having proved unsatisfactory.

*Mining engineer, Box 1180, Johannesburg, South Africa.

The Benoni Consolidated Gold Mines, Ltd., is an outcrop property on the Far East Rand, situated between the New Kleinfontein and the Apex. It is opened by three shafts of which two are being worked at present. The east shaft is inclined and is 2200 ft. deep. From it 11 levels are driven, connection being made with the Kleinfontein down to the seventh level. This section of the mine is the highest grade and here the most work has been done. The central shaft is vertical for about 600 ft., then inclined down 2000 ft. Eight levels have been driven and connection made with the east shaft down to the fifth. As the west shaft is partly under water no work is being done at present.

Three Reefs in Mine

Three reefs are encountered, the main reef, upper main reef and the main reef leader. The first two are being stoped at present as the last is poorer in grade. The ore reserves on the first of January, 1912, excluding all ore under 4.5 dwt., were as follows: 606,839 tons, width 43.12 in., value 6.56 dwt., percentage 62.50. But the average working cost for the whole Witwatersrand for January was 18s. 10d. on a tonnage of 2,067,161, and for new milling properties it is generally higher, so it would be better to take 5 dwt., as the minimum value. On this basis the reserves are: 322,671 tons, width 43.34 in., value 6.80 dwt., percentage 54. This decreases the profitable ore by 84,168 tons but increases the value from 6.56 to 6.80 pennyweights.

Preliminary crushing tests were made in the middle of November, and continued through December, during which period 20,000 tons were crushed. Since then the battery has been brought up to a capacity of 20,000 tons per month. The reduction works was such an innovation and so much was predicted for it that a description might not be amiss.

Benoni Consolidated Mill, on the Far East Rand

Locomotive Hauls Ore to Sorting House

The ore is hauled by a locomotive in 40-ton hopper-bottom cars from the shafts and dumped into a receiving bin from which it is conveyed by a 30-in. belt to the top of the sorting house and dropped into a Lea trommel revolving on rollers. It is 5 ft. in diameter and 21 ft. long and divided into three sections. The first is 8 ft. 6 in. long, and has 2-in. holes. The undersize from this section falls into a 150-ton fines storage bin, from which it is conveyed by a 16-in. cross belt to the 24-in. main belt ascending to the battery bin.

The second section is 5 ft. 6 in. long and has ⅜-in. holes. The ore is here sprayed with water to wash off the slime, enabling the waste to be recognized more readily. The undersize drops into a launder and runs to one of two filter-bottom settling tanks, 20-ft. diam. by 8 ft. deep. Each tank is provided with two doors placed over the main belt leading to the battery. The third section is 7 ft. long and is provided with 4-in. openings. The undersize goes to the first 36-in. picking belt and the oversize to a third belt 42 in. wide.

The three picking belts are provided with chutes 18x24 in. at 7 ft. centers, eight on a side; through which the waste rock is dropped into a storage bin holding 1200 tons. From here the waste is conveyed by a 30-in. cross belt to a long 30-in. belt and joins the sand residue from the Caldecott table to the dump. About 18.5% waste is sorted out. The coarse rock from the 42-in. picking belt is crushed by a 20x30-in. Blake-Marsden crusher and is returned by an 18-in. belt to the second 36-in. picking belt for further sorting. The first belt with its under-4-in. product discharges through a crusher (not running) into a crushed-ore bin below holding 300 tons. The product of the second belt is split and sent to two Blake-Marsden crushers, which discharge into the crushed-ore bin. From the latter the ore passes on to the main 24-in. belt leading to the battery. Pebbles for the tube mill are picked off the 42-in. belt and the 18-in. return belt and dropped into a small bin below, from which they are conveyed by the 16-in. dry-fines belt to the battery belt and dropped into a small bin at the end of the battery bin.

Battery of 55 Stamps

The main conveying belt at the top of the battery discharges on to a belt provided with a Blake-Denison automatic weigher. The ore then drops to a shuttle belt and is distributed in the battery bin, holding 2000 tons.

The distinctive features of the battery are steel king posts, long narrow boss-heads and 5-stamp cam shafts. Provision is made at the back of the battery for more stamps for the Apex mine with which it is later proposed to amalgamate.

In fact the reduction works is situated on Apex ground. The battery consists of 55 stamps, 2200 lb. in weight, dropping into Bremner open-front mortar boxes. It is actuated by a 375-hp. motor from a lineshaft provided with clutches.

The concrete mortar block is of particularly massive construction. The shoes are 14 in. long by 9 in. diameter; bosshead 7 ft. 9 in. long by 9 in. diam. for 12 in. at each end, and the remainder 6 in. diam.; tappet 18 in. long by 9 in. diam. and stems 10 ft. 3 in. long by 4 in. diam. There is one guide on the stem and another on the boss. The number of drops per minute is 99½ and the height of drop, 8½ in. Belt feeders are provided but are not satisfactory. The capacity of the battery is 14 tons through an 8-mesh screen, or 22 tons through a 3-mesh, without using excessive water, as the classifiers are heavily loaded.

Plates Follow Tube Mills

The pulp passes direct to four Stadler classifiers, 2 ft. 6 in. diam. by 4 ft. deep with one molasses-spigot outlet, where a rough classification is made before entering four Ernest Newell & Co. tube mills, 5 ft. 6 in. diam. by 22 ft. long lined with bar iron set in concrete. Tube pebbles are fed by hand, an ammeter showing when there are enough present. A 110-hp. motor operates them.

The overflow from the classifiers joins the discharge from the tube mills and passes to one of two 8-in. Robeson-Davidson pumps run by a 40-hp. motor and is elevated to the amalgamating tables. There are 28 amalgamating plates 4 ft. 8 in. wide, originally shaking, but as experiment showed no advantage, they were stopped and the angle changed to about 12° or until the pulp flowed freely from the plate. The extraction by amalgamation is 55%. In the plate house are also the amalgam press, cleanup barrels, batea and plates for treating black sand, etc.

From Plates to Cyanide Mill

The pulp from the plates runs to one of two 8-in. Robeson-Davidson pumps operated by an 85-hp. motor and is raised to four Stadler classifiers, 3 ft. 6 in. diam. by 4 ft. deep provided with four tops, where a final classification is made, the underflow being returned to the tube-mill classifiers. The overflow goes to six Stadler classifiers, 5-ft. diam. by 4 ft. deep placed over a Caldecott table.

The Stadler classifier consists of a cylinder or tank with molasses-spigot outlets, 1¼ in. or more in diam., an interior overflow launder and a center impeller to throw the pulp horizontally. It was found that there was a tendency for the spigot to "breakaway" and let slime and water through, also the sand carried excessive moisture.

This was overcome by suspending a hollow cast-iron ball 9 in. in diam., a few inches above the bottom discharge, the theory being that when the pulp got thin on one side the greater specific gravity of the pulp on the other, forced the ball over until the pressure was equalized. The classifiers are operated with from 3 to 3½ ft. of sand in them. It was found that with a tap wide open a depression was formed on the side of the ball nearest the center of the classifier and the ball moved that way, which to a large extent, prevented slime and water from being discharged.

After the introduction of the balls the underflow carried 27% moisture, and there was from 3 to 5% plus-200-mesh in the overflow, which was so much better than formerly that the balls were installed in all the classifiers. The device is patented by J. M. Neill, the reduction officer.

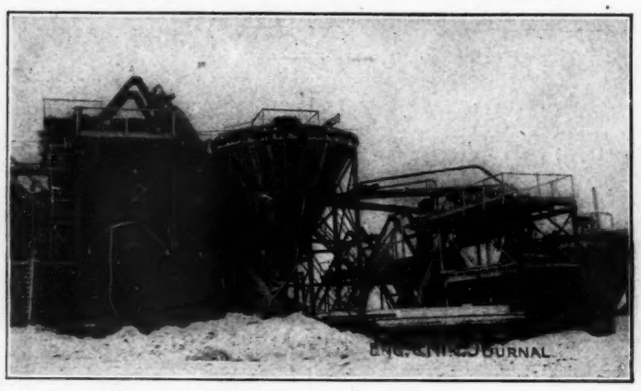
Trouble with Arbuckle Cones

The overflow from the classifiers goes to three Arbuckle cones of 21-ft. diam., with sides at 60°, terminating in a casting and a long upwardly inclined casing inside of which is a spiral conveying screw 21½ in. in diam. and 9 in. between threads. It has three speeds and is actuated by a bevel gear and pinions. It is designed to deliver 2 ft. above the top of the cone into a mixing agitator.

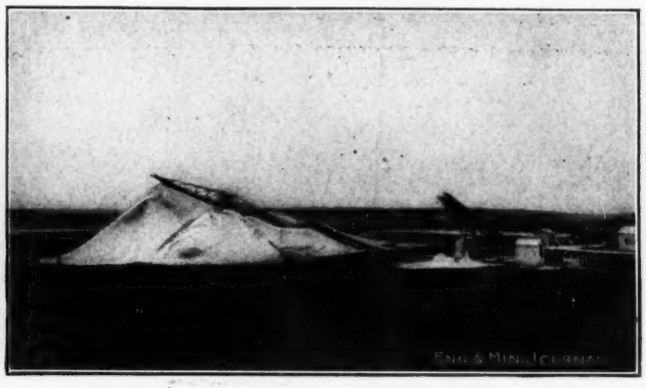
Inside the cone and parallel to the sides of it, is a nest of frustums of cones, 5½ in. apart on the perpendicular. Eight of the cones are 6 ft. long, the four cones within these being 4 ft. long. The cones were later provided with a slow-moving agitator with iron arms of different lengths. For a time after starting a clean cone the pulp was discharged periodically, the moisture of the product varying greatly, then the discharge gradually ceased. The reason for this was found to be that the slime built up on the sides and arched over the outlet necessitating stopping the apparatus to prevent breaking the agitator.

Various devices were tried to prevent the arching without success, and after three months' experimentation the method was abandoned. Everything showed that if the slime reached the screw it would be delivered, but even then it is doubtful if the method would be successful as the pulp delivered was too thin.

The cones were then used as settlers and the slime pumped to the treatment agitators, but here again the pulp was too thin. The three cones are not large enough to settle 300 tons of slime per day so it was found more economical to store the slime in a dam temporarily and treat sand only. The clear overflow from the cones goes to a 24,000-gal. return-water tank and is pumped to two 55,000-gal. mill-water tanks.



Arbuckle Cones and Caldecott Table



Sand-tailing Dump, Benoni Consolidated

Caldecott Sand Table

The Caldecott table is a rotating horizontal filter of 20-ft. external diam. with a 30-in. annular launder and a false bottom covered with cocoa matting and jute. It has 137.5 sq.ft. of filtering area and makes 3 r.p.m. The false bottom is connected by eight radial pipes to a hollow spindle and a vacuum pump. It uses 3.4 hp. and 5 hp. operates the vacuum and a triplex pump; the vacuum varies from 3 to 10 in. The triplex pump is connected to the bottom of the receiver and pumps the water to the return-water tank.

The sand from the classifiers containing 27% moisture, falls on the table, makes almost a complete circuit and is continuously taken off by an inclined plow 3 ft. from the point of overflow. It then has 12% moisture. The filtering

medium proper consists of 8 in. of sand which is removed by lowering the plow when it gets hard and slimy.

The sand from the table drops into a launder is mixed with 0.15 cyanide solution and goes to the Way-Arbuckle continuous-treatment agitators, 32 in number, operated by compressed air. It originally went to two mixing agitators, 8 ft. diam. by 22 ft. deep, but there was not sufficient air, so they were bypassed.

The treatment agitators are 10-ft. diam. by 18 ft. 3 in. deep, fitted with a 12-in. air-lift column, terminating at the top of the tank and discharging on an annular plate 2 ft. wide to which are attached six launders, 18 in. wide, leading to 6-in. notches cut in top of the tank and connecting to adjacent tanks. The bottom of the launder is hinged for the last 12 in., so by raising the hinge the pulp can be thrown to each side. The air pressure is 13 lb., supplied by a Bellis & Morcon vertical compressor, direct connected to a 125-hp. motor, using 84 hp. to agitate 21 tanks.

Sand containing 6% on 60-mesh, 9% on 90-mesh and 85% through 90-mesh can be agitated up to 18% solid by volume. Above that amount sand accumulates in certain tanks and agitation ceases. To start again, high-pressure air pipes are shoved into the tank and the sand tapped from the bottom until agitation starts. By means of the six openings, the pulp can be sent in any direction, except from the outside tanks, and the tanks operated in parallel or in series.

No Provision for Stoppages

No provision is made for cutting out a tank and to take care of inequalities of agitation, a stopped tank gradually fills, due to sand in suspension from neighboring tanks. Therefore the whole plant must be kept moving. Also a sudden stoppage of power for five minutes is sufficient to pack the sand, especially the pyritic part of it, in the bottom of the tanks, so that it takes from two to 12 hr., depending on the thickness of the pulp, to get the whole plant going again; and many tons of sand and solution are tapped out on the cement floor beneath.

The capacity of the compressor is only sufficient to agitate 21 tanks, so the others were connected by a reducing valve to a high-pressure main, from a distant mine compressor. But the increased extraction, from 78 to 82%, did not pay for the air and it was stopped. Judging from the time it takes the sand to reach the last agitator when the plant is empty it must be agitated from 10 to 14 hr. The absence of slime works against the running of the plant as it helps greatly in agitation.

Zinc-Box Precipitation

From the agitators the pulp passes to two 5-in. Robeson-Davidson pumps then to four Stadler classifiers 5 ft. diam. by 4 ft. deep, the overflow going to three Arbuckle dewatering cones, 21 ft. diam., the underflow, of which there is but little, is tapped out periodically and joins the underflow from the classifiers. The clear overflow goes to four filter-bed classifiers, 20 ft. diam. by 8 ft. deep, then to eight 12-compartment zinc boxes, each box being divided into two sections, and then to two sump tanks 40 ft. diam. by 10 ft. deep.

The underflow from the classifiers is mixed with barren solution from the zinc boxes and goes to two mixing agitators (not now used) and thence to the last set of Stadler classifiers, three in number, 5 ft. diam. by 4 ft. deep, the overflow of which goes to a second set of three dewatering cones. The clear solution goes to two sump tanks, 40 ft. diam. by 10 ft. deep, to be used for mixing with sand at first table, and the thickened slime at bottom is pumped to the dam, the solution being returned to the sump tanks.

The underflow of the last set of classifiers falls on a second Caldecott table similar to the first, and the clear solution goes to the clarifiers. The sand, which is the final residue and contains 12% moisture, is plowed off the table and falls on an 18-in. cross belt, joins the waste rock from the sorting house and is conveyed to the dump. As the system is a continuous one trouble with the sand-conveying belts would disarrange the whole plant, so a parallel 18-in. belt is provided dumping on the ground, the sand later being sent to the dump.

Sand Conveying Costs Low

The system of sand conveying in use was developed at the New Kleinfontein reducing works and is characterized by low operating costs and inexpensive installation. It consists of a 60-ft. pivoted boom, capable of being swung 180°, carrying a 30-in. belt. It discharges on to a 30-in. belt running on a cantilever 110 ft. long, 13 ft. wide at the middle and 8 ft. 6 in. at the end, 60 ft. of which projects out. The cantilever rests on wheels, running on a track for horizontal swinging and there is a truck for pulling it ahead up the dump. When the limit of the boom is reached it is moved up the dump and the lower belt lengthened to it. The cantilever, boom, and lower belt are operated independently by motors.

Sorting House and Stamp Battery at Benoni Consolidated Milly Rand

In the extractor house are the zinc boxes, zinc lathe, Krupp ball mill for grinding slag, solution and return-water pumps and the melting furnace. The furnace consists of two drying compartments, 3 ft. 2 in. by 6 ft. 2 in., holding three trays each, a reverberatory furnace, 6 ft. 2 in. by 7 ft. 4 in., holding 14 No. 80 graphite crucibles, and a Cornish furnace holding two No. 60 crucibles all compact.

The precipitate and short zinc are acid treated in lead-lined tanks out in the air, with sodium bisulphate, a byproduct of the local dynamite factory. The bisulphate is dissolved in water in a tank 10 ft. diam. by 5 ft. 6 in. deep. The zinc is placed in four tanks 5 ft. diam. by 5 ft. deep, bisulphate run on and the zinc stirred until dissolved. The product is then dropped into a tank 10 ft. diam. by 5 ft. 6 in. deep and pumped through a 24-in. Johnson press. The precipitate is dried and melted, giving bullion 950 fine.

It is impossible with the present equip-

ment to treat the slime, the agitator costs are excessive, 8d. per ton treated for air alone, and much of the conveying system runs continuously at a fraction of its capacity. Therefore, from the viewpoint of the directors the cyanide plant is a failure. The sorting house, battery, tube mills and plate house give complete satisfaction, so they are considering the erection of a plant, using as much of the present equipment as possible, to consist of sand-leaching vats and possibly a Butters filter.

Electrification of Butte, Anaconda & Pacific R. R.

The electrification of the Butte, Anaconda & Pacific R.R. is of exceptional interest because it represents one of the largest installations of electrical equipment for steam-railroad service and the first in this country where 2400-volt direct-current locomotives will be employed. Construction work necessary to effect the change from a steam to an electrically operated road is now progressing actively, and it is hoped that the entire electrification work will be completed and the electric operation commenced by the fore part of next year.

The section of the road to be equipped is that between Butte and Anaconda, Mont., comprising about 30 miles of main-line single track and a total single-track mileage including the sidings, smeltery tracks, etc., of approximately 114 miles. The remaining 24 miles of track, embracing the mine tracks on Butte Hill, minor sidings, etc., will continue to be operated by steam; although it is probable that the entire system will be electrified at an early date.

To use 2400-Volt Direct Current

The 2400-volt direct-current system was adopted by this road after a careful and exhaustive study of local conditions. The system adopted was deemed best for the heavy steam-road service handled over its tracks. The main-line trains of the Chicago, Milwaukee & Puget Sound R.R. run over the Butte, Anaconda & Pacific track for a distance of 16 miles, which calls for trunk-line freight and passenger service in addition to the heavy local-freight traffic. The haulage of freight consists principally of copper ore from the Butte mines to the smelters at Anaconda, and of mine supplies, lumber, etc., moving in both directions. The total amount of freight handled is approximately 5,000,000 tons per year. Complete trains, weighing 3400 tons and made up of 50 loaded steel ore cars, will be handled by two locomotives against a ruling grade of 0.3%. Single locomotives will be used for making up trains in the yards and for spotting cars.

The entire electrical equipment for this installation is being furnished by the General Electric Co. Seventeen 2400-volt direct-current locomotives of the articulated truck type, each weighing 75 tons, have been ordered. Each locomotive will be equipped with four No. 229, 1200-volt, commutating-pole, twin-geared railway motors insulated for operation two in series on 2400 volts. The motors are designed throughout to secure exceptionally good ventilation, and a forced circulation of air will be employed in addition to the ventilation secured by the fan incorporated in the armature. Control of the motors will be effected through special Sprague General Electric Type M control equipments, a dynamotor being used to furnish 600 volts for the operation of the contractors, lights and air compressor. The dynamotor will have two windings, 1800 volts and 600 volts, and will be direct connected to a blower for ventilating the motors. Heating of the locomotive cabs will be accomplished by means of special heaters using 2400-volt direct current from the trolley circuit.

Two of the locomotives are designed for passenger service. A schedule of eight passenger trains per day, four each way, is maintained for local traffic, and the average train is composed of a locomotive and three standard steam-road passenger cars. The passenger locomotives will be duplicates of the freight locomotives, except that they will be geared for higher speed. When hauling a train of three coaches, they will be capable of running 45 miles per hour on level track. Current for lighting the cars will be taken from the 600-volt circuit of the dynamotor, and for heating the coaches will be tapped from the 2400-volt trolley circuit on the locomotive.

Substations 26 Miles Apart

Two 2400-volt substations are being installed, one at Butte and the other at Anaconda, 26 miles apart. Duplicate equipments are to be installed in the two stations and will each consist of two 1000-kw. synchronous motor-generator sets, each composed of two 500-kw., 1200-volt compound-wound, compensated, commutating-pole generators insulated for operation in series at 2400 volts, direct connected to a 1450-kva., 2300-volt three-phase, 60-cycle synchronous motor; also two 50-kw. induction-motor exciter sets, and alternating-current and direct-current switchboards. Power for operating the motor-generator sets will be supplied from the 2300-volt, 60-cycle, three-phase buses in the substation of the Great Falls Power Co., to which power is transmitted at 50,000 volts from the hydraulic power stations of the company.

A regulator will be installed in each substation to maintain constant voltage automatically at the terminals of the synchronous motors. Through this method of operation the possibility of the sets dropping out of step on extreme overloads is said to be eliminated. The direct-current switchboard will follow standard practice for 1200-volts with remote-control circuit breakers and switches. The feeder circuits and generator circuits will be protected by 2400-volt direct-current aluminum-cell lightning arresters.

Current for operating the locomotives will be taken from overhead conductors. A special flexible catenary trolley suspension will be used over the larger part of the line, with direct suspension over some of the difficult sidings, smeltery tracks, etc. Side brackets and cross-span construction will be employed where local conditions demand. Numerous yards are to be electrified and at one point it will be necessary to span 12 tracks, which will be accomplished by cross-span construction using a pole between the eighth and ninth tracks.

The Butte, Anaconda & Pacific is a most important link in a transcontinental railroad system and its electrification is attracting widespread attention. The fact that the substations are situated 26 miles apart and but a moderate amount of feeder copper is required, notwithstanding the heavy traffic handled, strongly emphasizes the advantages of the high-voltage direct-current system.

Current Mineral Output of Ontario

The report of the Bureau of Mines of the province of Ontario shows the following outputs of metals for the first three months of 1912: Gold, 573 oz.; silver, 7,439,044 oz.; copper, 2537 tons; nickel, 4722 tons; pig iron, 116,824 tons; cobalt and nickel oxides, and crude cobalt material, 538,170 lb. Of the silver production, 7,006,842 oz. came from Cobalt, 285,942 oz. from South Lorrain, and Gowganda, 147,103 oz. Shipments were: Ore, 4346 tons; concentrates, 2528 tons; bullion, 1,445,834 oz. Of the 5,561,998 oz. of silver recovered from ore and concentrates, 4,197,161 oz. were recovered by Ontario plants. There was no gold recovered at Porcupine during the quarter owing to the destruction of the mills by fire.

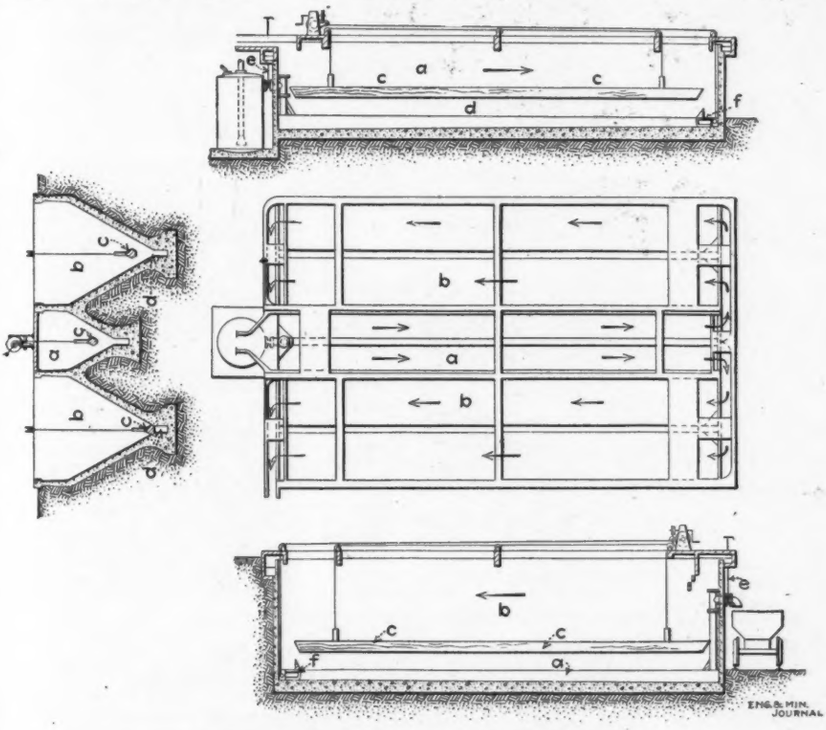
Venezuelan Plaster of Paris

A concession has been given Eusebio Chellini, of Caracas, for making plaster of paris (*Daily Consular and Trade Notes*, June 24, 1912). Señor Chellini is to have exclusive right to operate a factory in the Federal District for 5 years, with 3 years' extension; to import free of duty the ovens, triturating mill, grinding mill, wire-screen, bolter and iron for roof. Señor Chellini agrees to use only native rock and to sell plaster to the Government at 12% reduction. The contract is to be in force after approval by the national congress, and the factory should be in operation within a year thereafter.

Mud Disposal in Blast Furnace Gas Purification

By Alfred Gradenwitz*

The clarification of the water used in purifying blast-furnace gas, which is laden with large amounts of dust, imposes on the works a considerable additional duty, the more so as the available space and fresh water grow less. Attempts have therefore been made to render this unproductive operation as inexpensive as possible. Dr. I. Steuer has suggested for this result a new type of settling tank, which concentrates the mud to a bottom area as small as possible, and discharges the portion most thoroughly settled periodically during clarification, so as to separate it entirely from any supernatant water. The illustration represents the arrangement of these settling tanks as constructed by the Wasser- und Abwasserreinigung Ltd. of Neustaat a. Haardt.



Disposal of Mud from Gas Purification

The water having been used in gas purification, first traverses a lengthy tank, *a* (or several tanks in the case of larger volumes), with small cross-section, at a speed which is only overcome by the specific gravity of any heavy ore particles, while any lighter turbid matter is prevented from settling. Such matter is settled in the larger tanks *b*, arranged parallel to one another, at a hardly noticeable rate of water flow during 1½ to 2 hours. The process of clarification as well as the collection and discharging of the mud settled, however, is the same in both cases.

The side walls converging at the angle of 60° towards a longitudinal groove *d*, immediately direct any settling dust particles towards this groove, thus causing the lower part of the tank gradually to fill with mud. The latter thus concentrates at an increasing rate as it sinks towards the bottom, thus filling the groove with thick and relatively dry mud, after a given time of operation, whereas the upper layers are fresher and thinner as they lie nearer the surface.

A beam *c*, suspended above the mud groove *d* (at about the level of the lower edge of the clarified portion), is dropped from time to time on the groove, thus separating the lowermost mud, which is most concentrated, from the remaining contents of the tank with which it only communicates at one end of the groove. This mud groove *d* is continued by a riser, closed by a quick-acting slide *e*, which leads into the open below the water level. At the other end of the dust groove there is a piston disk *f*, moving horizontally in guides. As the slide *e* is opened, this disk receives the hydrostatic pressure working behind it, thus discharging the whole of the contents of the mud groove, while preventing its being diluted by water.

This simple arrangement with a relatively small difference between the water level and the height of the mud outlet allows the heavy pulpy mud to be discharged within a few seconds without any interruption in the settling operation. A hand-operated winch then allows the beam to be lifted, restoring at the same time the folding piston disk to its initial position, after which there begins a new settling period.

The means of conveyance used for receiving the thick mud discharged from the tank, are adapted to the conditions of the case, being, for instance, tank-wagons or vertical compressed-air cylinders. The latter scheme, on account of its simplicity, will be found preferable in nearly all cases, especially when the mud has only to be transported short distances. The mud obtained in the first tank, which contains 40 to 50% of iron oxide, should not of course be mixed with the less valuable mud from the main settling tank, being discharged through a special branch-pipe in order to be used in the briquetting of dust, for which purpose it will be found especially suitable.

The process above described has been carried out at several blast-furnace works of Lorraine and Luxemburg, in plants, each having an output of 700 to 1800 cu.m. of gas water per hour, while several other plants are in course of construction. These installations have so far given every satisfaction.

As seen from the accompanying figures, the space requirements of the new scheme are small, being about 75 to 100 sq.m. for the complete clarification of 100 cu.m. per hour. In many cases it will be found possible to convert existing clarification plants into the new type of settling tanks, thus allowing large areas which are so far covered with settling ponds, etc., to be used for other purposes while removing a number of other drawbacks. The same process has been advantageously applied to the disposal of sewage mud.

*3 Regensburgerstrasse, Berlin, Germany.

First Recorded Use of Mineral Coal in America

By Charles R. Keyes*

Relying upon general history, the discovery of mineral coal in America dates back to the beginning of the eighteenth century. The earliest record in Pennsylvania is 1704, twenty years after the privilege of colonization was granted by Charles II. to Penn. Anthracite was first known in the Wyoming district of Pennsylvania in 1766; and its discovery in the Lehigh Valley took place 25 years later. Virginia coals appear to have been mined for the first time near Richmond in 1750; and at the close of the Revolutionary war they were shipped from this region to Philadelphia, New York and Boston.

There are however, authentic records of the earlier use of mineral coal in this

*Consulting engineer, Des Moines, Iowa.

country. Its discovery belongs to the interior of the continent rather than to the Atlantic seaboard, where the first permanent European settlement took place, where it is now so extensively mined, and where it is known to be so widely distributed. In the continental interior the discovery of coal precedes that of the East by at least 50 years; while in a limited way to be sure, its use by the Indians goes back to a still more remote period.

In the Upper Mississippi valley the earliest definite mention of the existence of mineral fuel in the form of coal appears to be that of the Jesuit missionaries in the Assiniboine land, in what is the State of Minnesota of today. As early as 1659, in describing the Poualak (Assiniboine tribes), record is made of mineral coal as follows: "As wood is scarce and very small with them nature has taught them to burn coal (*charbon de terre*) in its place, and to cover their wigwams with skins." It is quite possible that the Iowa Indians of the northern prairies also made use of the lignite deposits of the region such as are found, for example, in Brown County, Minnesota, near the headwaters of the Des Moines River.

When LaSalle established, in 1680, Fort Crève Coeur on the Illinois River near the present site of Peoria, large coal beds were found and used. Father Hennepin, who was assiciated with La Salle, states in the journal of his travels, that at the place mentioned mineral coal exists. In an English edition of his map of the Upper Mississippi region the location is clearly represented. That he was not in any way mistaken is amply shown by subsequent developments.

In his letters regarding the natural productions found along the Illinois River, written a few years later, LaSalle also mentions the fact of the occurrence of coal at Crève Coeur. These letters were recently reprinted in Paris by Margry. Still another very early reference to the occurrence of coal in the Upper Mississippi Valley is that of Le Gardeur de l'Isle, who writes in 1722 from Fort Chartres, near Kaskaskia, that he accompanied one Renault to the Illinois River to look after copper and coal mines.

The French early knew of the existence of coal which outcrops on the Missouri River near its mouth, at a point called La Charbonnière. Nearly a century later, in 1805, Pike, when he started on his famous trip to the sources of the Arkansas River, passed the place. He says: "Six miles below St. Charles, on the south side, in front of a village called Florissant, is a coal hill, or as it is termed by the French, La Charbonnière. This is one solid hill which probably affords sufficient fuel for all the population of Louisiana."

Measuring Air Consumption

By George H. Gilman*

The science known as efficiency-engineering is, in some of its aspects, merely the application of ordinary common sense to the problem at hand. When purchasing rock drills or hammer drills, for example, it is often desirable to conduct tests upon several makes or types, to determine their relative efficiency for the work in hand. One of the tests which it is important to make is that for air consumption, in order to arrive at the quantity of power used per foot of hole or per cubic yard of rock removed. This is a factor too often left to guesswork, or ascertained only roughly.

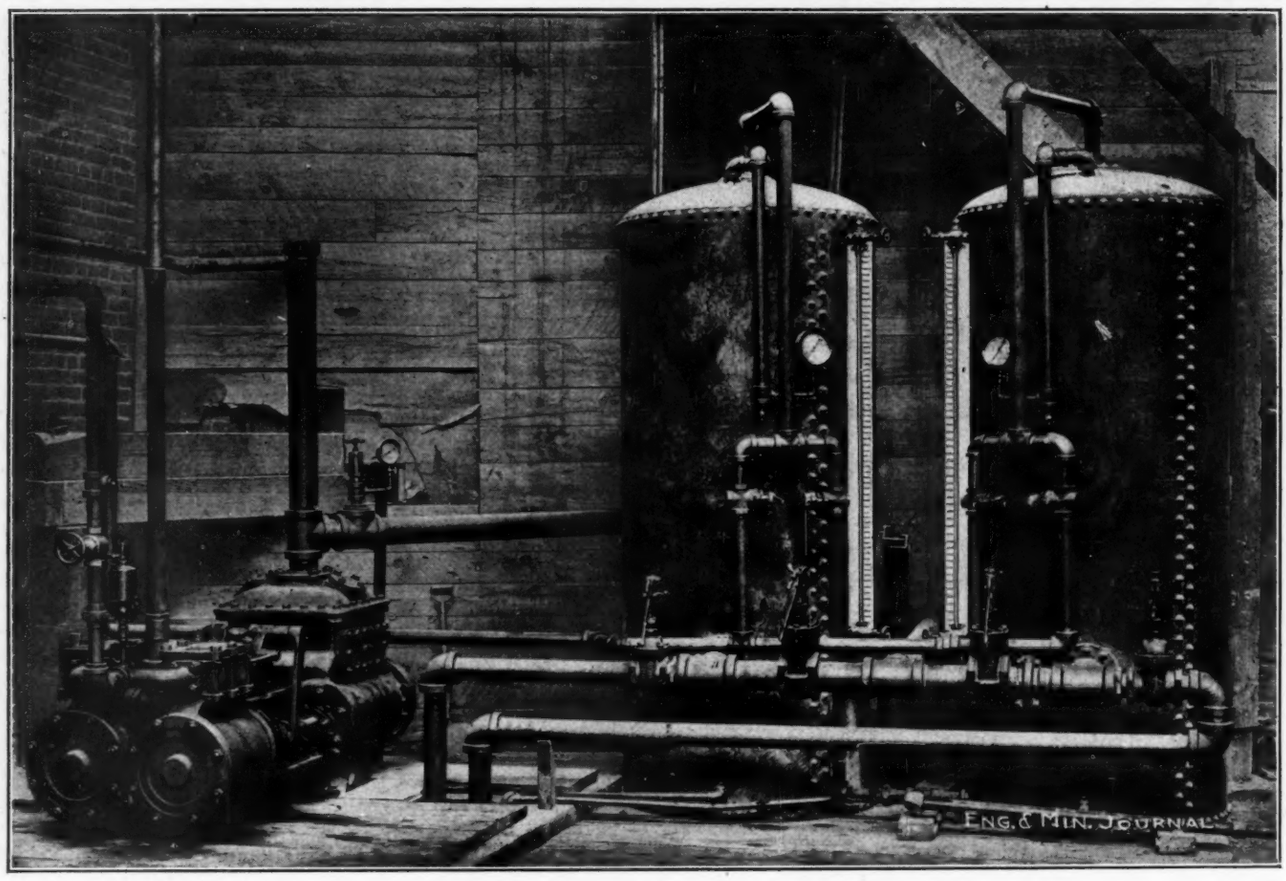


Fig. 1. Displacement Tanks for Measuring Air Used by Drills

Extended experiments have shown that the displacement tank method is as accurate as, and probably more reliable than, the special mechanical air meters which have been devised at various times.

A satisfactory apparatus for this purpose is shown in the accompanying illus-

*Claremont, N. H.

trations. It consists of two large vertical tanks, so arranged that they may be filled with air at any desired pressure. The drill to be tested is connected to one of these tanks, the tanks are filled with air at the proper pressure, and the large steam pump, shown at the left of Fig. 1, is started. The height of water in the gage glass is noted, and the drill started working. The air pressure in the tank is kept constant by the admission of water from the pump. After a run of sufficient length to secure accuracy, the drill is stopped, and the height of the water in the gage glass is again noted.

The increase in volume of the water in the tank is the amount of air used by the drill during its run, and from this the cubic feet of free air used per minute may be figured.

Two tanks are supplied, so that one may be used while the other is being

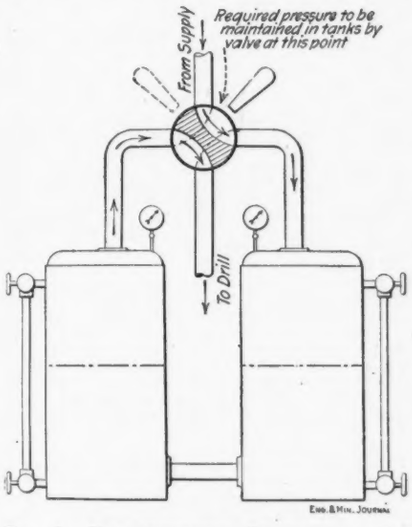


FIG. 2. DIAGRAMMATIC SKETCH OF AIR MEASURING TANKS

filled with air, thus allowing tests to be run over a considerable period of time.

An apparatus of the kind above referred to, however, is rather expensive to install, as it involves the use of a steam pump and a reservoir for the water used.

The sketch, Fig. 2, shows a type of displacement apparatus, at present used successfully by various mining companies. This is much less expensive than the apparatus with pump and reservoir, and will meet the requirements of any mine or quarry to practically as good advantage, although possibly, it is not quite as accurate.

Two small tanks, say about two feet in diameter and four to five feet long, are connected together at the bottom by a pipe of good size, say three inches, and about half filled with water. Gage glasses for observing the water level are attached to each receiver. Out of the top of each receiver is brought a pipe and connected to a four-way valve. When the valve is set in the position shown by the full line, water in the right-hand tank will be forced into the left-hand tank by the air pressure, and the air in the latter tank will be driven out and passed through the four-way valve to the drill or other machine being tested. When the water arrives at a definite point on the upper end of the gage glass on the left-hand tank, the four-way valve is quickly thrown to the position shown by the dotted line, when the process will be reversed and the air in the right-hand tank will be driven out and passed to the machine under test. By counting the number of times each tank is filled or emptied during a given interval of time, it will be seen without further explanation that the amount of air consumed by the machine under test can be determined by reducing to cubic feet of free air the volume of air under pressure which has been displaced.

Yerington District, Nevada

LUDWIG CORRESPONDENCE

Shipments from the mines of the Yerington district to the Mason Valley smeltery at Thompson, continue to increase and at the smeltery the two furnaces 25 ft. long and 44 in. wide at the tuyeres are to be increased to 30 and 35 ft. respectively. At present the one furnace is smelting approximately 700 tons of ore each 24 hr. By increasing these furnaces to the length mentioned above, the capacity of one single furnace will be as great as was figured for the entire plant originally. These additions to the furnaces are to be installed from the shops on the ground and at present a number of the parts are ready. The Dwight-Lloyd sintering plant is doing excellent work and making considerable headway on the accumulated dust. One machine comprises the present installation but a second machine is to be added soon. The machine now in use is the largest size made. Its speed, of course, varies with the material to be sintered and on this account its capacity is variable. At present the machine is running through about 75 tons of flue dust per day, the three shifts of three men each being worked continuously. The amount of gasoline consumed by the machine is not obtainable now, but sometimes two burners are required, and for some of the flue dust little coke is needed; for other dust a considerable amount of coke is required. A triplex Gould pump with 2x4-in. pistons is being installed to pump water from the townsite well to the lower Mason Valley workings.

OTHER PRODUCERS

At Yerington station, the Northern Light Copper Co. is piling up ore. The property is 20 miles east of Yerington and the mine is employing about 10 men. Duncan McKenzie, of Yerington, is managing the mine at present. The Bradley mine, owned by Charles Holland, of Yerington, shipped one car of ore recently. The New Yerington Copper Co. also shipped one car. Mr. Browngrose, William Boyle and others who own the Mohawk mine east of Yerington, have several cars of ore ready for shipment to the smeltery. Several small properties in the hills to the east and south of Mason are shipping regularly to the smeltery. The Malachite Copper Co. is shipping one car of ore per day, and the McConnel mine is shipping two cars. It is the intention of the Malachite management to begin operations soon and to do considerable development work immediately adjacent to the south of the Mason Valley mines works. The Mason Valley company has developed its property to within a short distance of the lower end line of the Malachite and indications are good for the development of ore in the Malachite property, close to the end line. The Mason Valley company has encountered 72 ft. of commercial ore in the diamond-drill work in the bottom level of the mine. This work is being done by a Sullivan diamond drill, on contract.

The Bluestone mine, owned by Captain De Lamar, has four men remodeling the roasting plant and experimental mill and will have the work completed soon. Martin Heller, manager of the De Lamar properties paid a short visit to the property recently. No definite advice as to the plans of the management are obtainable. C. A. Weck is superintendent. The Nevada Douglas Copper Co. during a recent week shipped 2943 tons of ore, contained in 57 cars. This gives an average daily tonnage of 406 tons. A total of 700 tons of gypsum were shipped to the Western Gypsum Co.'s plant at Reno. A contract has been let for 300 ft. in the new Douglas Hill tunnel, which is 150 ft. below the upper Douglas Hill tunnel, from which all the ore is drawn on Douglas Hill. At a point 250 ft. north of the mine workings on Douglas Hill, "spot" ore has been encountered. This ore contains chalcocite and chalcopyrite, impregnating the garnet. A winze has been sunk about 15 ft. and still continues in this material.

Some lead ore is being shipped from what is called Bald Hill, about four miles south of the town of Wellington, in the Pine Nut Hills. Much development is being done in this section, as well as in the country adjacent to Red Cañon, where lead-copper ore containing gold and silver has been discovered. Some time this summer regular shipments are expected from these mines, the shipping point of which will be Hudson, Nevada.

The production of calamine in Upper Silesia in 1911 was 118,960 tons; of blende, 375,210 tons; of lead ore, 47,722 tons.

The Mining Index

A Classified Bibliography of the Current Literature of Mining and Metallurgy

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print), in the original language, for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

COAL AND COKE

19,114—ACCIDENTS—Coal Mine Accidents in West Virginia. David Victor. (Coal Age, June 15, 1912; 1 p.) 20c.

19,115 — ACCIDENTS — Lessons from Recent Mine Disasters. (Mines and Minerals, April, 1912; 2½ pp.) Address by J. A. Holmes. 20c.

19,116 — ACCIDENTS — West Virginia Mining Accidents. F. C. Cornet. (Coal Age, June 8, 1912; 2½ pp.) 20c.

19,117—ASIA MINOR—Die rechtlichen und wirtschaftlichen Verhältnisse im Steinkohlengebiet von Heraklea, Kleinasian. Kern. (B. u. H. Rundschau, May 5, 1912; 6¼ pp.) Legal and economic conditions in the coal field of Heraklea. 40c.

19,118 — BLASTING — Firing Shots in Still Air. John Verner. (Coal Age, June 1, 1912; ¾ p.) 20c.

19,119 — BOILER PLANT — Colliery Boiler Room Practice. F. R. Wadleigh. (Coal Age, May 25, 1912; 3¼ pp., illus.) 20c.

19,120—BREAKER—The Buck Mountain Coal Breaker. (Mines and Minerals, June, 1912; 3¾ pp., illus.) An illustration of the most advanced practice in cleaning and preparing anthracite. 20c.

19,121 — BRITISH COLUMBIA — Bear River Coal Field, B. C. C. F. J. Galloway. (Can. Min. Journ., June 1, 1912; 2¼ pp., illus.) Conclusion of article previously indexed. 20c.

19,122—CHANGE HOUSE for Coal Miners. A. A. Steel. (Mines and Minerals, June, 1912; 1¼ pp., illus.) Suggested plans for construction and methods for keeping the building in order. 40c.

19,123—CHINA—The Lanchow Mines, in China. K. P. Swensen. (Coal Age, June 1, 1912; 3⅜ pp., illus.) 20c.

19,124—COAL CUTTER—A Rope-Driven Coal Cutter. Wilfred L. Spence. (Colliery Guardian, June 7, 1912; 1¾ pp., illus.) 40c.

19,125—COAL DUST—Discussion of W. M. Thornton's paper on "Experiments on Liquid Mixtures for Laying Coal Dust." (Trans. N. Eng. Inst. Min. and Min. Soc., Feb. 13, 1912; 20 pp.,

19,126—COAL DUST AS FUEL — A Dust-Fuel Boiler and Its Uses. Hugh V. Dart-Davis. (Trans. Manchester Geol. and Min. Soc., Feb. 13, 1912; 20 pp., illus.)

19,127—COAL-DUST EXPLOSIONS and Their Prevention. J. Harger. (Journ. Scc. Chem. Ind., May 15, 1912; 3¾ pp.)

19,128—COAL-DUST QUESTION, The. W. E. Garforth. (Colliery Guardian, June 7, 1912; 1⅜ pp.) Presidential address before the Instn. of Min. Engrs. 40c.

19,129—COKE—Note sur la Mise en Service et l'Arret des Fours a Coke a Récupération des Sous-Produits. René Gillon. (Rev. Univ. des Mines, April, 1912; 10½ pp.)

19,130—ELECTRIC POWER PLANTS for Mines. Henry D. Jackson. (Coal Age, June 1, 1912; 3 pp., illus.) 20c.

19,131—ELECTRICITY in the D. L. & W. Mines. (Mines and Minerals, June, 1912; 2 pp., illus.) Applications of electric power by the D. L. & W. Co. to hoisting pumping, haulage and lighting. 40c.

19,132—EQUIPMENT — Developments at Cortonwood Colliery, England. (Iron and Coal Tr. Rev., May 24, 1912, 3 pp., illus.) 40c.

19,133—EXAMINATION — The Use of X-Rays in the Examination of Coal. F. C. Garrett. (Iron and Coal Tr. Rev., June 7, 1912; 1 p., illus.) Paper before North of Eng. Inst. of Min. and Mechan. Engrs. 40c.

19,134—EXPLOSION—The Jed, W. Va., Mine Explosion. (Mines and Minerals, May, 1912; 4½ pp., illus.) 20c.

19,135—EXPLOSION—Report of the Bignall Hill Colliery Explosion. (Colliery Guardian, May 3, 1912; 3⅜ pp., illus.) 40c.

19,136—EXPLOSIONS—The Prevention of Explosions in Mines. John Harger. (Trans. Manchester Geol. and Min. Soc., Feb. 13, 1912; 35 pp.)

19,137 — FILLING — Hydraulic Filling in European Mines. L. Bucherer. (Mines and Minerals, June, 1912; 3 pp., illus.) The dry filling method formerly used in Silesia, and the hydraulic methods now in use. 40c.

19,138—GAS—Discussion of George J. Ralph's paper on "The Holmes-Ralph Gas-Detecting Portable Electric Lamp." (Trans. N. Eng. Inst. Min. and Mech. Eng., Jan., 1912; 5½ pp.)

19,139—GERMANY—The Working of the Thick Coal Seams of Upper Silesia. Berent Conrad Gullachsen. (Trans. N. Eng. Inst. Min. and Mech. Eng., Jan., 1912; 11 pp., illus.)

19,140—HEALTH OF MINERS — The Hookworm and the Miner. R. S. Ogilvie and N. P. Brooks. (Coal Age, June 1, 1912; 1 p.) 20c.

19,141—HOISTING—Discussion of John Paul's paper on "The Walker Overwinding-Prevention Gear for Colliery Winding Engines, Etc." (Trans. Min. Inst. of Scotland, Apr. 13, 1912; 4½ pp.)

19,142 — LIGNITE — Zur chemischen Charakteristik der Braunkohlen. Ed. Donath. (Oest. Zeit. B. u. H., May 25, 1912; 4 pp.) Concerning the chemical characteristics of lignite. 40c.

19,143—LOOKOUT MOUNTAIN COAL MEASURES, Tenn. and Ala. A. W. Evans. (Mines and Minerals, June, 1912; 2 pp., illus.) Geological formation, thickness, quality of the coal as shown by analyses, costs of mining. 20c.

19,144—LOW-GRADE FUEL—Vergasung minderwertiger Brennstoffe. Mann and Wüstefeld. (Glückauf, May 25, 1912; 5 pp.) Gasification of low-grade fuel. 40c.

19,145—MINE AIR—Quality and Quantity of Mine Air. Karl F. Schoew. (Coal Age, June 15, 1912; 2 pp.) Abstract of paper before West Virginia Coal Min. Inst., June 6, 1912. 20c.

19,146—MINE FIRES—Gas Analysis as an Aid in Fighting Mine Fires. George A. Burrell and Frank M. Seibert. (Bureau of Mines, Technical Paper 13, 1912; 16 pp., illus.)

19,147 — MINING METHODS — Why Leave Shaft Pillars? W. H. and Basil H. Pickering. (Colliery Guardian, June 7, 1912; 1⅓ pp., illus.) 40c.

19,148—NORTH CAROLINA—Coal on Dan River, North Carolina. R. W. Stone. (U. S. Geol. Surv., Bull. 471-B, 1912; 40 pp., illus.)

19,149—POWER SYSTEM—The Lancashire Electric Power Co.'s System, and Its Application to Lancashire. Charles D. Taite. (Trans. Manchester Geol. and Min. Soc., Feb. 13, 1912; 21 pp., illus.)

19,150 — RESCUE APPARATUS — An Improved Mine Rescue Apparatus. (Coal Age, May 25, 1912; 1¾ pp., illus.) Describes the Servus apparatus, using a compound of oxygen and sodium hydrate, which liberates oxygen when water is dropped on it. 20c.

19,151 — RHENISH - WESTPHALIAN COAL SYNDICATE—Bericht des Rheinisch - Westfälischen Kohlen - Syndikats über das Geschäfts-jahr 1911. (Glückauf, May 11, 1912; 5 pp.) Report of the Rhenish-Westphalian coal syndicate for the year 1911. Condensed. 40c.

19,152—SAFETY LAMP—An Acetylene Safety Lamp. (Coal Age, June 15, 1912; 1½ pp., illus.) Translated from "Revista Minera." 20c.

19,153—SAFETY LAMPS—Gas-Mixing Apparatus for Safety Lamps. (Min. Journ., June 1, 1912; 1 p., illus.) 40c.

19,154—SCREENING PROBLEM in Illinois. A. Bement. (Coal Age, June 1, 1912; 1 p., illus.) 20c.

19,155—SOUTH AFRICA—The Collieries of South Africa. (South African Eng., May, 1912; 1½ pp., illus.) Describes Coalbrook colliery at Springs, Transvaal. 40c.

19,156 — STORAGE — Deterioration of Coal in Storage. A. Bement. (Power, June 25, 1912; ¾ p.) 20c.

19,157 — TAR OIL — Teerölverwertung für Heiz- und Kraftzwecke. R. Hausenfelder. (Stahl u. Eisen, May 16, 1912; 11¼ pp., illus.) Utilization of tar oil for heating and power purposes. 40c.

19,158—TIPPLE—Ein neuer Wagenkipper. (Zeit. d. Vereines deutscher Ing., Mar. 16, 1912; 4 pp., illus.)

19,159 — TUNNEL — Panther Creek Drainage Tunnel. (Mines and Minerals, May, 1912; 3 pp., illus.) 20c.

19,160 — UNLOADING — The Coal-Unloading Terminal at Sewalls Point, Va. Floyd W. Parsons. (Coal Age, May 25, 1912; 2½ pp., illus.)

19,161—UTAH—The Consolidated Fuel Co. of Utah. Benedict Shubart. (Coal Age, Apr. 27, 1912; 2 pp., illus.) 20c.

19,162 — VENTILATION — Points in Mine Ventilation. J. T. Beard. (Coal Age, June 8, 1912; 2 pp.) Paper before W. Va. Coal Min. Inst., June 6, 1912. 20c.

19,163—VENTILATING SYSTEM without Doors. H. J. Nelms. (Coal Age, June 8, 1912; 1 p., illus.) 20c.

19,164—WAGES—Der Mindestlohn im britischen Steinkohlenbergbau. Jüngst. (Glückauf, May 11, 1912; 5 pp.) The minimum wage in British coal mines. 40c.

19,165—WASHERY — Fireproof Coal Washery, Panama, Ill. John A. Garcia. (Coal Age, May 4, 1912; 2½ pp., illus.) 20c.

19,166 — WASHING — Experimental Coal-Washing Plant at McGill University. J. B. Porter. (Colliery Guardian, May 17, 1912; 1 p., illus.) Extracts from recently issued report on Canadian coals. 40c.

19,167 — WASHINGTON — The Roslyn, Washington, Coal Field. Joseph Daniels. (Coal Age, May 25 and June 8, 1912; 5½ pp., illus.) 40c.

19,168—WATER PURIFICATION for Collieries. (Coal Age, May 11, 1912; 2 pp., illus.) 20c.

19,169—WEST VIRGINIA—Mining Coal on the Virginian Railroad. Floyd W. Parsons. (Coal Age, May 18, 1912; 5 pp., illus.) 20c.

19,170—WYOMING—The Acme Co.'s Plant in Wyoming. Jesse Simmons. (Coal Age, May 11, 1912; 4 pp., illus.) 20c.

19,171 — WYOMING — The Sheridan, Wyo., Coal Field. Jesse Simmons. (Coal Age, Apr. 27, 1912; 2½ pp., illus.) 20c.

COPPER

19,172—ARIZONA—Miami Copper Co. B. Britton Gottsberger. (Min. and Sci. Press, May 25, 1912; 1½ pp., illus.) From annual report for 1911. 20c.

19,173—ARIZONA—The Commonwealth Mine. Llewellyn Humphreys. (Min. and Sci. Press, June 8, 1912; 2 pp., illus.) 20c.

19,174—ARIZONA—Work of the Ray Consolidated. D. C. Jackling. (Min. and Sci. Press, May 18, 1912; 3 pp., illus.) From annual report for 1911. 20c.

19,175—ASSAY—New Kink in Iodide Assay. E. J. Hall. (Eng. and Min. Journ., June 10, 1912; ½ p.) 20c.

19,176—COPPER DETERMINATIONS at Granby Smeltery, British Columbia. Frank E. Lathe. (Eng. and Min. Journ., June 1, 1912; 2 pp.) 20c.

19,177—JAPAN—The Osaruzawa Mine. Takeshi Kawamura. (Min. and Sci. Press, May 15, 1912; 1¾ pp., illus.) 20c.

19,178—LEACHING Applied to Copper Ore. W. L. Austin. (Mines and Methods, May, 1912; 5⅞ pp.) Eighteenth article of series, describing electrolytic deposition of copper from solutions. 20c.

19,179—NEVADA CONSOLIDATED—Mining and Milling at the Nevada Consolidated. G. L. Sheldon. (Mex. Min. Journ., May, 1912; 1¾ pp., illus.) 20c.

19,180—NEW MEXICO—Work of the Chino Copper Co. D. C. Jackling. (Min. and Sci. Press, May 25, 1912; 2 pp., illus.) From annual report for 1911. 20c.

19,181—PORPHYRY DEPOSITS—Types of Porphyry Copper Deposits. W. L. Tovote. (Min. and Sci. Press, May 18, 1912; 2 pp., illus.) 20c.

19,182 — REFINING — Usine d'affinage du Cuivre de la Société Métallurgique de Livourne. G. Desvallières. (Metaux et Alliages, Apr., 1912; 1 p.) 40c.

19,183—RUSSIA—An American Copper Plant in the Caucasus. (Min. and Eng. Wld., May 18, 1912; 1⅓ pp.) Notes on the Caucasus Copper Co. 20c.

19,184—SAMPLING—The Mathematics of Copper Sampling. A. M. Smoot. (Eng. and Min. Journ., June 22, 1912; ¾ p.) Discussion on articles by D. M. Liddell and Edward Keller. 20c.

19,185—SMELTING—Copper Smelting at Kyshtim. Ernest J. Carlyle. (Eng. and Min. Journ., June 22, 1912; 4 pp., illus.) Pyrite smelting is practiced. 20c.

19,186—SMELTING PRACTICE at the Plant of the Compagnie du Boleo. (Min. and Sci. Press, May 18, 1912; ½ p.) 20c.

19,187—UTAH COPPER COSTS in "Lake Superior Figures." Heath Steele. (Eng. and Min. Journ., May 11, 1912; 1⅓ pp.) 20c.

GOLD DREDGING

19,189—CALIFORNIA—Gold Dredging in the Folsom Field of California. A. H. Martin. (Min. and Eng. Wld., May 25, 1912; 2 pp., illus.) 20c.

19,190—CALIFORNIA—Reducing California Dredging Costs. A. H. Martin. (Mines and Minerals, June, 1912; 1 p.) Economies that have resulted from the use of dredges having buckets of larger capacity. 20c.

GOLD AND SILVER—CYANIDATION

19,191—COBALT—Cyaniding at Nova Scotia Mill. C. L. Hargrave. (Eng. and Min. Journ., June 8, 1912; 1⅓ pp.) 20c.

19,192—DETERMINATION OF GOLD AND SILVER in Working Cyanide Solutions. William Bettel. (Queensland Govt. Min. Journ., April, 1912; 1 p.) 60c.

19,193—ELECTRIC FURNACE at Lluvia de Oro, for Melting Precipitate or Smelting Gold-Silver Concentrate. H. R. Conklin. (Eng. and Min. Journ., June 15, 1912; 3⅓ pp., illus.) 20c.

19,194—MANGANESE-SILVER ORES — Refractory Manganese-Silver Ores. Will H. Coghill. (Min. and Sci. Press, June 1 and 8, 1912; 8 pp.) 40c.

19,195—SLIME DENSITY TABLE, A New. H. B. Lowden. (Met. and Chem. Eng., June, 1912; 1 p.) 40c.

19,196—SOLUTION METER for Use in Cyanide Plants. James Spiers. (Min. and Eng. Wld., June 1, 1912; 1 p., illus.) 20c.

19,197—WAY-ARBUCKLE PROCESS at Benoni Mill. (Min. and Sci. Press, May 25, 1912; 1½ pp., illus.) 20c.

GOLD AND SILVER—GENERAL

19,198—ARIZONA—The Vulture Mine, Arizona. W. E. Defty. (Eng. and Min. Journ., May 25, 1912; 1 p., illus.) 20c.

19,199—AUSTRALIA—Increased Australian Silver Production in 1911. John Plummer. (Min. and Eng. Wld., June 1, 1912; 1 p.) 20c.

19,200 — BRITISH COLUMBIA — Portland Canal Mining Co., B. C. (Can. Min. Journ., June 1, 1912; 1¾ pp., illus.) 20c.

19,201—CALIFORNIA—The Los Burros Mining District, Monterey County, Calif. Charles H. Davis. (Min. and Sci. Press, May 18, 1912; 2¼ pp., illus.) 20c.

19,202 — COLORADO — The Gold of Newlin's Gulch, near Denver, Colo. G. Montague, Butler. (Min. Sci., June 6, 1912; 1¼ pp., illus.) 20c.

19,203—COSTS—Mining and Milling Costs in the Goldfield District. A. H. Martin. (Min. and Eng. Wld., June 15, 1912; 1⅓ pp., illus.) 20c.

19,204 — HYDRAULIC MINING — The Conservation of Water for Hydraulic Sluicing in the Palmer River District, Queensland. S. R. Stons. (Min. and Eng. Wld., June 1, 1912; 2 pp., illus.) 20c.

19,205—HYDRAULICKING in Beauce County, Que. Fritz Cirkel. (Eng. and Min. Journ., June 1, 1912; 3½ pp., illus.) 20c.

19,206—IDAHO—Progress in the Cœur d'Alene District, Idaho. Stuart Rice. (Min. and Eng. Wld., June 8, 1912; 5¾ pp., illus.) 20c.

19,207—MEXICO—Work of the Amparo Mining Co., Jalisco, Mexico, during 1911. (Min. and Sci. Press, June 8, 1912; ½ p.) 20c.

19,208—MINT—The Denver Mint and Its Operation. Frank M. Downer. (Min. Sci., May 16, 1912; 1 p.) 20c.

19,209—NEVADA—The Minerals of Tonopah, Nevada. Arthur S. Eakle. (Univ. of Calif., Bull. Dept. of Geol., May 17, 1912; 23 pp., illus.)

19,210—ONTARIO—Lake of the Woods Mining District. William J. Richards. (Mines and Minerals, June, 1912; 1½ pp., illus.) The Sultana mine; efforts to sink a shaft at the bottom of a lake in 18 ft. of water. 20c.

19,211—ORE DRESSING—Neuere Versuche aus dem Gebiete der Aufbereitung gold-haltiger Erze, vornehmlich Pyrite. Frd. Freise. (Oest. Zeit. B. u. H., Apr. 27, May 4, 11 and 18, 1912; 9½ pp.) $1.40.

19,212 — PHILIPPINES — The Geology and Mineral Resources of the Aroroy District, Masbate. Henry G. Ferguson. (Philippine Journ. of Sci., Oct., 1911; 40 pp., illus.)

19,213—PLACER MINING in the Province of Quebec. H. A. Ball. (Min. and Sci. Press, May 25, 1912; 1¼ pp.) 20c.

19,214—PLACERS — Prospecting Gold Placers in Korea. J. J. Martin. (Min. and Sci. Press, May 18, 1912; 2 pp., illus.) 20c.

19,215—PORCUPINE—Vipond Porcupine Gold Mines Co., Ltd. W. S. Dobbs. (Min. and Sci. Press, June 1, 1912; ¾ p., illus.) 20c.

19,216 — RAND — Record Sinking at State Mines, Witwatersrand. A. Cooper-Key. (Min. and Eng. Wld., June 1, 1912; 1¼ pp.) 20c.

19,217—RAND—The Auriferous Conglomerates of the Witwatersrand. F. H. Hatch. (Reprinted from "Types of Ore Deposits," published by the Min. and Sci. Press, 1911; 20 pp., illus.)

19,218—RAND—The East Rand Proprietary Mines, Ltd., Report. (Min. and Eng. Wld., Apr. 6, 1912; 1½ pp.) 20c.

19,219—RAND—Migration of Miners and Accidents on the Rand. A. W. Rogers. (Eng. and Min. Journ., June 8, 1912; 1 p.) 20c.

19,220—SAMPLING—The "Salting" of Samples and Means of Detection. G. A. James. (Min. and Eng. Wld., May 25, 1912; 1⅓ pp.) 20c.

19,221—SINALOA—The Mocorito District in Sinaloa. G. L. Sheldon. (Eng. and Min. Journ., June 1, 1912; ½ p.) 20c.

19,222—SONORA—The Mines of Sonora Valley, Sonora, Mexico. Claud Hafer. (Min. and Eng. Wld., Apr. 27, 1912; 2 pp., illus.) 20c.

19,223—SOUTH AFRICA—Mines of the Pilgrims Rest District. I, Mali Dyke. Arthur W. Hendren Frost. (South African Min. Journ., Apr. 13, 1912; ¾ p.) 20c.

19,224—STAMP MILLS—Notes on High Duty Gravity Stamp Mills. Peter N. Nissen. (Journ. Chem., Met. and Min. Soc. of South Africa, Mar., 1912; 8¼ pp., illus.) Reply to discussion. 60c.

19,225 — STAMP MILLS — Reinforced Concrete for Stamp Foundations. J. P. Fuller. (Min. Mag., Apr., 1912; 2¼ pp., illus.) 40c.

19,226—SUMATRA—Gold and Silver in Sumatra. S. J. Truscott. (Min. Mag., May, 1912; 9½ pp., illus.) 40c.

19,227—TEXAS—Gold and Rare Metal Mining near Llano, Texas. Alex. McLaren. (Salt Lake Min. Rev., May 15, 1912; 2½ pp., illus.) 20c.

19,228—UTAH—Notes on the Northern La Sal Mountains, Grand County, Utah. J. M. Hill. (U. S. Geol. Surv., Bull. 530-M, 1912; 22 pp., illus.)

19,229—VENEZUELA of Today. (Min. Journ., May 18, 1912; 1½ pp., illus.) 40c.

19,230 — VICTORIA — North Nuggety Ajax Mine, Daylesford. Victor Pabst. (Aust. Min. Stand., May 2, 1912; ⅝ p.) 40c.

IRON MINING AND ORE DRESSING

19,231—MAGNETIC CONCENTRATION of Iron Ores. Henry Louis. (Iron and Coal Tr. Rev., May 24, 1912; 2⅓ pp., illus.) Abstract of lecture before the West of Scotland Iron and Steel Inst. 40c.

19,232—MICHIGAN — Mining Practice on the Menominee Range. (Min. and Eng. Wld., Apr. 27, 1912; 2⅓ pp., illus.) 20c.

19,233—ONTARIO—The Eastern Michipicoten Iron Range. Alois Goetz. (Eng. and Min. Journ., June 1, 1912; 2½ pp., illus.) 20c.

19,234—SHAFT—Rolling Mill No. 2 Shaft, Michigan. P. B. McDonald. (Eng. and Min. Journ., June 22, 1912; 1 p., illus.) 20c.

IRON AND STEEL—METALLURGY

19,235—ANNEALING—Die Bedeutung des Glühens von Stahlformuss. P. Oberhoffer. (Stahl u. Eisen, May 30, 1912; 3¼ pp., illus.) The importance of annealing steel castings. 40c.

19,236—BLAST—Dry-Air Blast. (Iron and Coal Tr. Rev., May 17, 1912; 1⅓ pp., illus.) 40c.

19,237—BLAST-FURNACE GAS — Asphyxiation of Blast-Furnace Gases. (Iron and Coal Tr. Rev., May 17, 1912; 1½ pp., illus.) From "Ann. des Mines de Belgique." 40c.

19,238—BLAST-FURNACE PLANTS—Neuere amerikanische Hochofenanlagen. Groeck. (Zeit. d. Vereines deutscher Ing., May 25, 1912; 6½ pp., illus.) New American blast-furnace plants.

19,239—BLAST-FURNACE PRACTICE—Zinnhaltiger Bleiglanz aus einem Eisenhochofen und das System Schwefelblei und Schwefelzinn. W. Heike. (Metallurgie, May 22, 1912; 6½ pp., illus.) Stanniferous galena from a blast furnace and the system lead-sulphide and tin sulphide. 40c.

19,240—BLOWING ENGINE—Chart for Determining Blowing Engine Speed. J. C. Watson. (Power, June 25, 1912; ¾ p., illus.) 20c.

19,241—CARBON IN IRON—Die Löslichkeit von Kohlenstoff in Eisen. Ruff. (Zeit. d. Vereines deutscher Ing., Apr. 27, 1912; 2¾ pp.) On the solubility of carbon in iron.

19,242—CAST IRON—New Processes for Chilling and Hardening Cast Iron. Thomas D. West. (Journ. A. S. M. E., June, 1912; 26 pp., illus.)

19,243 — CHARCOAL IRON — Making Charcoal Iron Boiler Tubes. George Thomas. (Power, June 11, 1912; 3 pp., illus.) From a paper before the Nat. Assn. of Am. Boiler Mfrs. 20c.

19,244—CHILLABLE IRONS—Tests of Chillable Irons. Thomas D. West. (Journ. A. S. M. E., June, 1912; 18 pp., illus.)

19,245—CORROSION of Nickel, Chromium and Nickel-Chromium Steels. J. Newton Friend, J. Lloyd Bentley and Walter West. (Iron and Steel Inst., May, 1912, advance sheets; 9½ pp., illus.)

19,246—CORROSION of Steel and Its Prevention. Allerton S. Cushman. (Iron Tr. Rev., May 23, 1912, 2¾ pp., illus.) Paper before Am. Iron and Steel Inst. 20c.

19,247—ELECTRIC FURNACE as a Possible Means of Producing an Improved Quality of Steel. William R. Walker. (Met. and Chem. Eng., June, 1912; 2½ pp.) Paper before Am. Iron and Steel Inst. 40c.

19,248—ELECTRIC POWER—Advantages of Automatic Control in Steel Plant Operation. Stewart C. Coey. (Proc. A. I. E. E., May, 1912; 6 pp., illus.)

19,249 — FOUNDRY — Das Eisengiessereiwesen in den letzten zehn Jahren. E. Leber. (Stahl u. Eisen, May 30, 1912; 11¾ pp., illus.) Continuation of article previously indexed. 40c.

19,250—IRON, VANADIUM AND CARBON—The Chemical and Mechanical Relations of Iron, Vanadium and Carbon. J. O. Arnold and A. A. Read. (Iron and Steel Inst., advance sheets, May, 1912; 12¼ pp., illus.)

19,251 — MAGNETIC ENRICHMENT—Magnetische Anreichung von Ural-Erzen in Herräng (Schweden). (Stahl u. Eisen, May 16, 1912; 4¼ pp., illus.) 40c.

19,252—MALLEABLE CAST IRON. James Aston. (Wisconsin Engr., May, 1912; 11 pp., illus.) 40c.

19,253—METALLURGICAL DEVELOPMENTS in Steel Practice. John S. Unger. (Iron Tr. Rev., May 23, 1912; 2¾ pp.) Paper before Am. Iron and Steel Inst. 20c.

19,254—OPEN-HEARTH FURNACE of a Detachable Type. (Foundry, June, 1912; 8⅓ pp., illus.) Describes Carr furnace in the plant of the Alloy Steel Casting Co. 20c.

19,255—PYROMETERS—The Installation and Use of Pyrometers in Steel Mills. C. S. Gordon. (Met. and Chem. Eng., June, 1912; 3 pp., illus.) Equipment and methods of control at Illinois Steel Co.'s Works. 40c.

19,256 — ROLLING MILLS — Cambria Steel Co.'s Motor-Driven Merchant Mills. (Iron Tr. Rev., May 30, 1912; 8 pp., illus.) 20c.

19,257—SAFETY DEVICES—How Cambria Steel Co. Safeguards Its Employees. (Iron Tr. Rev., June 13, 1912; 6½ pp., illus.) 20c.

19,258 — SHERARDIZING — Ueber das Trockenverzinken oder Sherardisieren. Ernst Bernheim. (Stahl u. Eisen, May 23, 1912; 3½ pp., illus.) 40c.

19,259—STEEL FOR GUNS—Manufacture and Treatment of Steel for Guns. L. Cubillo. (Iron and Steel Inst., May, 1912, advance sheets, 33 pp., illus.)

19,260—STRUCTURAL COMPOSITION AND PHYSICAL PROPERTIES of Steel. Albert Sauveur. (Journ. Frank. Inst., May, 1912; 10 pp.) 60c.

19,261—SWEDEN—The Operation of Electric Ore Roads in Sweden. Oskar Gjessing. (Min. and Eng. Wld., May 25, 1912; 2 pp., illus.) 20c.

19,262—THERMIT—The Use of Anti-Piping Thermit in Ingots. C. Canaris. (Met. and Chem. Eng., Apr., 1912; 2¼ pp., illus.) 40c.

19,263 — TIN PLATE — Cowper-Coles Electrolytic Method for the Manufacture of Tin Plate and Tubes, Etc., of Iron. Wm. Palmaer and J. A. Brinell. (Jernkontorets Annaler, 1912; 34 pp.)

19,264 — TOOL STEEL — Influence of Heat on Hardened Tool Steels, with Special Reference to the Heat Generated in Cutting Operations. Edward G. Herbert. (Iron and Steel Inst., May, 1912, advance sheets; 17 pp., illus.)

19,265 — TROOSTITE — Mechanism of the Formation of Troostite. Denison K. Bullens. (Met. and Chem. Eng., Apr., 1912; 2¼ pp., illus.) 40c.

19,266—WELDING—Die Theorie des Schweissens von Stahl und ihre praktische. Anwendung. Bermann. (Zeit. d. Vereines deutscher Ing., Mar. 30, 1912; 6¼ pp., illus.)

19,267—WELFARE WORK — Helping the Workingmen to Help Themselves—Methods of Cambria Steel Co. (Iron Tr. Rev., June 6, 1912; 6¾ pp., illus.) 20c.

LEAD AND ZINC

19,268 — BLENDE ROASTING — Die Prinzipien der Blenderöstung in Muffelöfen. W. Hommel. (Metallurgie, May 8, 1912; 15 pp., illus.) The principles of blende roasting in muffle furnaces. 40c.

19,269—FLOTATION of Zinc Ores at Broken Hill, N. S. W. C. T. Durell. (Min. and Sci. Press, May 25, 1912; ½ p.) 20c.

19,270 — NEVADA — Zinc Mines of Southern Nevada. Douglas White. (Mines and Minerals, June, 1912; 3 pp.) A description of the Yellow Pine district, the ores, and the costs of mining and shipping. 40c.

19,271—OKLAHOMA—The Miami Zinc-Lead District, Oklahoma. Temple Chapman. (Eng. and Min. Journ., June 8, 1912; 1⅓ pp., illus.) 20c.

19,272—SEPARATION BY ROASTING AND MAGNETIC SEPARATION — A Plant for the Enrichment of Pyritic Blende Concentrates, Erected at the Pierrefitte Mines, France. E. C. Hugon. (I. M. M., Bull. 92, May 9, 1912; 9 pp., illus.)

19,273—SPELTER STATISTICS for 1911. W. R. Ingalls. (Eng. and Min. Journ., May 25, 1912; ⅛ p.) 20c.

19,274—ZINC OXIDE—The Volatility of Zinc Oxide. O. L. Kowalke. (Chem. Engr., May, 1912; 1¼ pp.) Paper before Am. Electrochem. Soc., April, 1912. 40c.

19,275 — ZINC SMELTING — Betrachtungen über die Wärmebilanz eines Siemens-Zinkofens. F. Eulenstein. (Metallurgie, May 22, 1912; 7 pp., illus.) To be continued. 40c.

19,276—ZINC SMELTING—The Origin of Zinc Smelting. W. Hommel. (Eng. and Min. Journ., June 15, 1912; 2¾ pp., illus.) 20c.

OTHER METALS

19,277 — ALUMINUM — L'Emploi des Cables en Aluminium pour les lignes électriques a haute tension. (Génie Civil, May 25, 1912; 1 p.) 40c.

19,278—ARSENIC—Zur Kenntnis der Arsenerzlagerstätten Bosniens. Friedrich Katzer. (Oest. Zeit. B. u. H., May 18 and 25, 1912; 6 pp.) 60c.

19,279—MANGANESE INDUSTRY in United States and Foreign Countries. (Min. and Eng. Wld., June 8, 1912; 1¼ pp.) Abstract from U. S. Consular Report. 20c.

19,280—PLATINUM in Colombia. Editorial. (Min. Journ., May 18, 1912; 1½ pp.) 40c.

19,281—RADIUM MINERALS of Saxony and Their Discovery. C. Schiffner. (Min. and Eng. Wld., June 15, 1912; 2 pp.) 20c.

19,282—RARE EARTHS—The Separation of the Rare Earths. C. James. (Journ. Am. Chem. Soc., June, 1912; 15 pp.) 60c.

19,283—TIN—Geologic Features of Tin Deposits. H. G. Ferguson and A. M. Bateman. (Econ. Geol., Apr.-May, 1912; 52¾ pp., illus.) 60c.

19,284—TIN — Nigerian Affairs. Editorial. (Min. Mag., May, 1912; 2¼ pp., illus.) 60c.

19,285—TIN—The Cornish Tin Ticketing. Harold E. Fern. (Min. Mag., May, 1912; 4 pp., illus.) 60c.

19,286—TIN LODES of Sandy Creek, Charters Towers District. W. E. Cameron. (Geol. Surv. of Queensland, Pub. No. 235; 4 pp.)

19,287—TIN RESOURCES of Alaska. Frank L. Hess. (U. S. Geol. Surv., Bull. 520-B, 1912; 6 pp.)

19,288—TITANIUM—A Study of the Rutile Group. Waldemar T. Schaller. (U. S. Geol. Surv., Bull. 509, 1912; 31 pp.)

19,289—VANADIUM. James O. Clifford. (Mines and Methods, May, 1912; 1⅓ pp.) 20c.

19,290 — VANADIUM — Its Ores and Uses. Thomas F. V. Curran. (Eng. and Min. Journ., June 1, 1912; 2¼ pp.) 20c.

19,291 — VANADIUM — The Concentration of Carnotite Ores, and Some Similar Ores. Siegfried Fischer. (Met. and Chem. Eng., June, 1912; 3 pp., illus.) 40c.

19,292—ZIRCONIFEROUS SANDSTONE near Ashland, Virginia. Thomas L. Watson and Frank L. Hess. (U. S. Geol. Surv., Bull. 530-P, 1912; 9 pp.)

NONMETALLIC MINERALS

19,293—ALUNITE in the San Cristobal Quadrangle, Colorado. Esper S. Larsen. (U. S. Geol. Surv., Bull. 530-F, 1912; 7 pp.)

19,294—BAUXITE—The Production of Bauxite and Aluminum in 1911. W. C. Phalen. (Advance chapter from Mineral Resources of the U. S.; 1911; 19 pp.)

19,295—CLAY in the Portland Region, Maine. Frank J. Katz. (U. S. Geol. Surv., Bull. 530-I, 1912; 5 pp., illus.)

19,296—CLAYS—Notes on the Clays of Delaware. George C. Matson. (U. S. Geol. Surv., Bull. 530-I, 1912; 17 pp.)

19,297—DIAMONDS—A Diamantiferous Gem-Gravel from the West Coast of Africa. F. H. Hatch. (Extract from Geol. Mag., N. S., Vol. IX, Mar., 1912; 4 pp., illus.)

19,298—DIAMONDS, Their Occurrence, Recovery, Treatment, Sale and Utilization. (Min. Journ., May 25, 1912; 1½ pp.) 40c.

19,299—FULLER'S EARTH—The Production of Fuller's Earth in 1911. Jefferson Middleton. (Advance chapter from Mineral Resources of the United States, 1912; 7 pp.)

19,300 — GEM MINERALS of Utah. (Salt Lake Min. Rev., May 30, 1912; 1⅓ pp., illus.) Variscite, topaz, agate, beryl, garnet, etc. 20c.

19,301—GEMS—Commercially Important Artificial Gems. G. Montague Butler. (Proc., Colo. Sci. Soc., June, 1912; 20 pp., illus.)

19,302—GRAPHITE near Raton, New Mexico. W. T. Lee. (U. S. Geol. Surv., Bull. 530-L, 1912; 4 pp.)

19,303 — GRAPHITE — The Amherst, Quebec, Graphite Deposits. Fritz Cirkel. (Mines and Minerals, Apr., 1912; 1¾ pp., illus.) 20c.

19,304—MICA—Descriptive Mineralogy of Mica. Douglas B. Sterrett. (Mines and Minerals, May, 1912; 1¾ pp., illus.) 20c.

19,305—MICA in Idaho, New Mexico and Colorado. Douglas B. Sterrett. (U. S. Geol. Surv., Bull. 530-L, 1912; 16 pp., illus.)

19,306—OLIVINES in the Toowoomba Basalts. W. E. Cameron. (Geol. Surv. of Queensland Pub. No. 235; 3 pp.)

19,307—PHOSPHATE—A Modern Fertilizer Factory. Peter S. Gilchrist. (Am. Fertilizer Hand Book, 1912; 9½ pp., illus.)

19,308—PHOSPHATE—Russian Phosphate Industry. E. de Hautpick. (Min. Journ., June 8, 1912; ½ p.) 40c.

19,309—PHOSPHATE—Tennessee Phosphate Practice. James A. Barr. (Am. Fertilizer, June 1, 1912; 8½ pp., illus.) 20c.

19,310—PHOSPHATE DEPOSITS of the Rocky Mountain States. Lucius P. Brown. (Am. Fertilizer Hand Book, 1912; 5½ pp., illus.)

19,311—PHOSPHATE ROCK—The Production of Phosphate Rock in 1911. F. B. Van Horn. (Advance Chapter from Mineral Resources of the U. S., 1911; 14 pp.)

19,312—POTASH—Petrographisch-geologische Untersuchung des Salzgebirges im Werra-Fulda-Gebiete der deutschen Kalisalzlagerstätten. Beck. (Zeit f. prakt. Geol., Apr., 1912; 26 pp., illus.) Petrographico-geologic examination of the salt formation in the Werra-Fulda territory of the German potash-salts deposits. 60c.

19,313—PYRITES—Ofen zur sulfatisierenden Röstung kupferhaltiger Kiese. Richard. (Chem. Ztg., May 21, 1912; 1 p.) Furnace for sulphatizing roasting of cupriferous iron pyrites. 40c.

19,314 — SLATE — The Production of Slate in 1911. A. T. Coons. (Advance chapter from Mineral Resources of the U. S., 1911; 16½ pp.)

19,315—STRONTIANITE — Der Strontianitbergbau im Regierungsbezirk Münster. Schultze Höing. (Glückauf, Mar. 30, 1912; 1½ pp.)

19,316—TURQUOISE—Crystallized Turquoise from Virginia. Waldemar T. Schaller. (U. S. Geol. Surv., Bull. 509, 1912; 7 pp., illus.)

19,317—VARISCITE—Crystallized Variscite from Utah. Waldemar T. Schaller. (U. S. Geol. Surv., Bul. 509, 1912; 18 pp., illus.)

PETROLEUM AND NATURAL GAS

19,318—BAKU—The Petroleum Trade of Baku. (Petrol. Rev., May 18, 1912; 1 p.) 40c.

19,319—BURMA—The Oilfields of Burma. (Petrol. Rev., May 18, 1912; 2 pp., illus.) 40c.

19,320—ITALY—Ueber zwei Gasquellen in der Nähe von Pisa. Gigli. (Chem. Ztg., May 7, 1912.) Note on two gas wells in the vicinity of Pisa, Italy. 40c.

19,321—NAPHTHA—Die Naphtaindustrie von Baku. Seidl. (B. u. H. Rundschau, May 20, 1912; 2¼ pp.) The naphtha industry of Baku. 40c.

19,322—NEW ZEALAND—The Taranaki Oilfields of New Zealand. (Petrol. Rev., May 18, 1912; 1 p., illus.) 40c.

ECONOMIC GEOLOGY—GENERAL

19,323 — CALIFORNIA — Pseudostratification in Santa Barbara County, California. George Davis Louderback. (Univ. of Calif., Bull. Dept. of Geol., May 25, 1912; 19 pp., illus.)

19,324 — CANADA-ALASKA BOUNDARY—Geologic Investigations along the Canada-Alaska Boundary. A. G. Maddren. (U. S. Geol. Surv., Bull. 520-K, 1912; 20 pp.)

19,325 — NEVADA — The Minerals of Tonopah Nevada. A. S. Eakle. (Univ. of Cal., Bull. Dept. of Geol., May 17, 1912; 23 pp.)

19,326 — ORE DEPOSITION — Modern Theories of Ore Deposition. E. K. Soper. (Mines and Methods, April, 1912; 8⅓ pp.) 20c.

19,327—ORE DEPOSITS—A Plea for Rational Classification of Ore Deposits. Walter Harvey Weed. (Min. and Eng. Wld., May 25, 1912; ⅛ p.) 20c.

19,328—ORE DEPOSITS—Two Phases in the Genesis of Ore Deposits. G. W. Miller. (Min. and Eng. Wld., May 25 and June 1, 1912; 4 pp.) 40c.

19,329—PHILIPPINES—Geological Rec-

onnaissance of Mindanao and Sulu. III, General and Economic Geology. Warren D. Smith. (Philippine Journ. of Sci., Oct., 1911; 42 pp., illus.)

19,330—PHILIPPINES—Geologic Reconnaissance of Southeastern Luzon. George I. Adams and Wallace E. Pratt. (Philippine Journ. of Sci., Dec., 1911; 30½ pp., illus.)

MINING—GENERAL

19,331—ARIZONA—The Apache Mines of the Owl Head District, Pima Co., Arizona. Byron O. Pickard. (Min. Sci., May 30, 1912; 2 pp.) 20c.

19,332—BELGIUM—Statistique Rétrospective des Industries Extractives et Métallurgiques en Belgique pour la période 1901-1910. (Ministère de l'Industrie et du Travail, Administration des Mines, 1912; 95 pp.)

19,333 — BLASTING — Die elektrische Zündung beim Schachtabteufen. Lisse. (Glückauf, May 11, 1912; 2¾ pp., illus.) Blasting by electricity in shaft sinking. 40c.

19,334—BLASTING — Die Unfallgefahr bei der Schiessarbeit mit elektrischer Zündung und mit Zündschnurzündung. O. Dobbelstein. (Glückauf, Apr. 13, 1912; 2 pp.) 40c.

19,335 — BLASTING — Gefährdung der Schiessarbeit mit elektrischer Zündung durch den elektrischen Grubenlokomotivbetrieb. Kopplin. (Glückauf, May 25, 1912; 2¼ pp., illus.) Endangering blasts by electricity through the operation of electric mine locomotives. 40c.

19,336—BUREAU OF MINES—Work of the Bureau of Mines. (Eng. and Min. Journ., June 15, 1912; ¼ p.) Statement of Secretary Fisher to the Senate. 20c.

19,337—COST OF MINING a Ton of Ore. Heath Steele. (Eng. and Min. Journ., May 25, 1912; 1¼ pp.) Review of cost figures of different companies. 20c.

19,338—DAM—A Western Type of Movable Weir Dam. W. C. Hammatt. (Proc. A. S. C. E., May, 1912; 9 pp., illus.)

19,339 — DEVELOPMENT — Consideration Before Opening Mines. Arthur J. Hoskin. (Mines and Minerals. June, 1912; 2 pp.) Legal matters, topography, transportation, climate, labor, supplies, extent of property. 20c.

19,340 — DRILLING — Bohrmaschinelle Bergbaubetriebe. Henker. (Oest. Zeit. f. B. u. H., Apr. 6, 1912; 14¼ pp., illus.)

19,341—DRILLING — Cost and Time Study of Drilling Blast Holes with Well Drills. (Engineering and Contracting, June 5, 1912; 2½ pp.) Abstract of paper by R. R. Sanderson before the Natural Lime Mfrs.' Assn. 20c.

19,342—DRILLING—Methods of Teaching Rock Drilling at the University of Missouri. L. E. Young. (Eng. and Min. Journ., June 22, 1912; 2 pp., illus.) 20c.

19,343—ELECTROLYSIS — Damage by Electrolysis. E. W. Stevenson. (Eng. and Min. Journ., June 22, 1912; 1 p.) 20c.

19,344—EXPLOSIVE—Utahnite Safety Explosive. Martin Fishback. (Eng. and Min. Journ., May 25, 1912; 1 p., illus.) 20c.

19,345—EXPLOSIVES—A Simple Dynamite Thawer. W. H. DeBlois. (Can. Min. Journ., June 1, 1912; ¾ p., illus.) 20c.

19,346—EXPLOSIVES—Permissible Explosives Tested Prior to January 1, 1912, and Precautions to be Taken in Their Use. Clarence Hall. (Bureau of Mines, Miners' Circular 6, 1912; 19 pp.)

19,347—FINANCE OF A MINE, The. (Min. Mag., May, 1912; 5¾ pp.) Discussion by W. H. Goodchild, M. H. Burnham and L. H. Webber on article previously indexed. 40c.

19,348 — FIRE PROTECTION—Pumps for Fire Protection. A. W. Newberry. (Eng. and Min. Journ., June 1, 1912; 1 p., illus.) 20c.

19,349—FLOW OF WATER—Calculating the Flow of Water in Pipes. T. W. Holloway. (Power, June 4, 1912; 3¼ pp., illus.) 20c.

19,350—FOREST RESERVES—Mining on Forest Reserves. Merritt Booth. (Eng. and Min. Journ., June 22, 1912; 1½ pp., illus.) 20c.

19,351—GERMAN COLONIES—Die Mineralschätze der deutschen Kolonien. Gürich. (Bergbau, May 9, 1912; 1½ pp.) Mineral resources of the German colonies. 20c.

19,352—GERMANY — Die Bergwerksproduktion des niederrheinisch-westfälischen Bergbaubezirks im Jahre 1911. E. Jüngst. (Glückauf, May 18, 1912; 113 pp.) Production of the mines of the Lower Rhenish-Westphalian mining district in 1911. 40c.

19,353—GERMANY — Die Gewinnung der Bergwerke, Salinen und Hütten im Deutschen Reich und im Luxemburg im Jahre 1912. (Glückauf, May 4, 1912; 4½ pp.) The production of the mines, metallurgical and salt-works in the German Empire and in Luxemburg in 1911. 40c.

19,354—HOISTING — An Underground Hoisting Station in Southwestern Colorado. S. A. Worcester. (Eng. and Min. Journ., May 25, 1912; ⅞ p., illus.) 20c.

19,355—HOISTING—Mine Hoisting Systems Compared—II. Bruno V. Nordberg. (Eng. and Min. Journ., May 25, 1912; 3 pp.) 20c.

19,356—HOISTING—The Ilgner System in Electric-Hoisting Operations. Geo. E. Edwards. (Min. and Eng. Wld., May 11, 1912; 4 pp., illus.) 20c.

19,357—HOISTING ROPES—Die Sicherheit der Förderseile. Speer. (Glückauf, May 11, 18 and 25, 22¼ pp., illus.) $1.

19,358—LAWS—Revision of the Mining Laws. F. J. H. Merrill. (Min. and Sci. Press, June 1, 1912; 1½ pp.) 20c.

19,359—MEXICO—Conditions in Mexico. T. Lane Carter. (Min. Mag., May, 1912; 3½ pp., illus.) 60c.

19,360—MINE VALUATION. J. R. Finlay. (Eng. and Min. Journ., June 22, 1912; 1 p.) Paper before Min. and Met. Soc'y of America, May 16, 1912. 20c.

19,361—MINERS' BATHS. H. F. Bulman and W. B. Wilson. (Trans. N. Eng. Inst. Min. and Mech. Eng., Mar. and May, 1912; 21 pp., illus.) Also discussion.

19,362—MINING METHOD—A Problem in Deep-Mine Exploration by Crosscut. Carl Henrich. (Min. and Eng. Wld., June 1, 1912; 2 pp., illus.) 20c.

19,363—MINING METHOD—Breaking Ground Without Powder. G. E. Wolcott. (Eng. and Min. Journ., May 25, 1912; 1⅓ pp., illus.) 20c.

19,364—MINING METHOD—The Sublevel Stoping Method. F. W. Sperr. (Eng. and Min. Journ., June 15, 1912; 2 pp., illus.) 20c.

19,365—ORE BINS—Joplin Ore Bin Construction. (Eng. and Min. Journ., June 22, 1912; 1¾ pp., illus.) 20.

19,366—PROSPECTING—Locating Ore Deposits by Wireless Telegraphy. O. Trüstedt. (Min. and Eng. Wld., June 8, 1912; 2 pp., illus.) Translation of article in Zeit. f. prakt. Geol., No. 4, 1912. 20c.

19,367 — PROSPECTING — Ueber Erzsuchen mittels Elektrizität. O. Trüstedt. (Zeit. f. prakt. Geol., Apr. 12, 1912; 3⅓ pp., illus.) On prospecting for ore by means of electricity. 40c.

19,368 — PRUSSIA — Die Arbeitsverhältnisse auf den Bergwerks- und ähnlichen Betrieben in den preussischen Oberbergamtsbezirken. (Bergbau, May 7, 1912; 1¼ pp.) Labor conditions in mining and similar industries in the Prussian mining districts. 40c.

19,369—PUMPING—Unwatering a Mine with Electric Turbine Pumps. Percy E. Barbour. (Eng. and Min. Journ., May 25, 1912; ½ p.) 20c.

19,370—SHAFT SINKING — Discussion of W. B. Wilson's paper on "The Advantages of Freezing as a Method of Sinking Through Heavily Watered or Difficult Ground. (Trans. N. Eng. Inst. Min. and Mech. Engr., Jan. and Mar., 1912; 10 pp.)

19,371—SHAFT SINKING—Ueber das Abteufen des Tagbau-Bremsschachtes in Trifail. E. Pietsch. (Oest. Zeit. f. B. u. H., Apr. 13, 1912; 4 pp., illus.) 40c.

19,372 SHAFTS—Reinforced Concrete as Applied to Mine Shafts. E. R. Jones. (Min. and Eng. Wld., May 25, 1912; 1⅞ pp.) Abstract of paper before Mich. College of Mines Club, Feb. 25, 1912. 20c.

19,373—SPAIN—La Région Minière de Linarès-La Carolina. G. Braecke. (Rev. Univ. des Mines, Mar., 1912; 20 pp., illus.)

19,374—SOUTH AUSTRALIA—A Review of Mining Operations in the State of South Australia during the Half-year Ended Dec. 31, 1911. (Issued by F. C. Ward, Acting Secy. for Mines, Adelaide, South Aust.)

19,375—SURVEYING a Raise Connection with Transit. H. Y. Russell. (Eng. and Min. Journ., June 8, 1912; 1 p., illus.) 20c.

19,376—TIMBER—Konservierung von Grubenhölzern. (Bergbau, Apr. 4, 1912; 1 p.) 20c.

19,377 — TIMBER — Methods for the Preservation of Mine Timbers. G. B. McDonald. (Min. and Eng. Wld., May 18, 1912; 2 pp.) 20c.

19,378—TIMBER—The Preservation of Mine Timbers. E. W. Peters. (U. S. Dept. of Agriculture, Forest Service, Bull. 107, 1912; 27 pp., illus.)

19,379—TIMBER—Wood Preservation. James D. MacLean. (Wisconsin Engr., Apr., 1912. 7 pp.)

19,380—TRANSPORTATION—The Operation of Electric Ore Roads in Sweden. O. Gjessing. (Min. and Eng. Wld., May 25, 1912; 2 pp., illus.) 20c.

19,381—TUNNEL—Arthurs' Pass Tunnel, New Zealand. W. H. Gavin. (Eng. News, May 9, 1912; 3½ pp., illus.) 20c.

19,382—TUNNEL—Lining a Tunnel in Swelling Rock. Guy R. McKay. (Eng. Rec., May 25, 1912; 2⅓ pp., illus.) Description of methods used on the Snake Creek tunnel in Utah. 20c.

19,383—TUNNEL—The Laramie-Poudre Tunnel. Discussion by W. C. Hammatt, W. L. Saunders, Lazarus White, O. J. Swensson and B. H. Wait. (Proc. A. S. C. E., May, 1912; 16 pp.)

19,384—WAGES—Die Bergarbeiteröhne in Deutschland im Jahre 1911. (Glückauf, Apr. 27, 1912; 9 pp.) 40c.

ORE DRESSING—GENERAL

19,385—CRUSHERS—Types of Shaft Bearings for Gyratory Crushers. (Eng. and Contracting, May 29, 1912; 1¼ pp., illus.) 20c.

19,386 — CRUSHING — Heavy-Duty Crushing Rolls. S. W. Traylor. (Met. and Chem. Eng., June, 1912; 2 pp., illus.) 40c.

19,387 — ELECTROSTATIC SEPARATION in the San Juan District. F. S. MacGregor. (Min. Sci., May 23, 1912; 1 p., illus.) The Huff process at the Sunnyside mine near Silverton. 20c.

19,388—JIG—Joplin Hand Jig. (Eng. and Min. Journ., June 1, 1912; 1½ pp., illus.) 20c.

19,389—JIGS—Steel Tray and Support for Hancock Jigs Used in No. 3 Mill of Doe Run Lead Co. (Eng. and Min. Journ., June 15, 1912; 1⅓ pp., illus.) 20c.

19,390—SCREEN—A Durable Shaking Screen. Roy Reddie. (Mines and Minerals, June, 1912; 1 p.m., illus.) 20c.

19,391—SEPARATION—Ore Separation by Decrepitation. Henry E. Wood. (Eng. and Min. Journ., June 15, 1912; ⅞ p.) 20c.

19,392 — TAILINGS—Converting Tailings to Commercial Products. A. H. Martin. (Mines and Methods, May, 1912; 2⅞ pp., illus.) Describes rock-crushing plant of Natomas Consolidated in California. 20c.

19,393 — WILFLEY TABLE KINKS Used in Joplin District. Claude T. Rice. (Eng. and Min. Journ., June 8, 1912; 1 p., illus.) 20c.

METALLURGY—GENERAL

19,394—ALLOYS—Untersuchungen über das System Kobalt-Kohlenstoff. G. Boecker. (Metallurgie, May 8, 1912; 7 pp., illus.) Researches on the system cobalt-carbon. 40c.

19,395—ELECTRICITY AND CHEMICAL ACTION. Harry C. Jones. (Eng. and Min. Journ., May 18, 1912; 4⅓ pp.) 20c.

19,396 — ELECTROLYSIS — Electricity Applied to Chemistry. Harry C. Jones. (Eng. and Min. Journ., May 25, 1912; 3 pp.) A discussion of the electrolysis and of electrolytic separations. 20c.

19,397—FURNACE CHARGES — Calculation of Furnace Charges—V. Regis Chauvenet. (Met. and Chem. Eng., June, 1912; 4½ pp.) 40c.

19,398—PYROMETRY — Radiation Pyrometry. G. A. Shook. (Met and Chem. Eng., June, 1912; 1 p., illus.) Second paper on theory of radiation pyrometers. 40c.

19,399—ROASTING—Mechanischer kontinuierlich arbeitender, als Trommel ausgebildeter muffelröstofen. Paul Schmieder. (Metallurgie, May 22, 1912; 1 p., illus.) Mechanical continuous working cylinder furnace arranged as muffle furnace. (U. S. pat. No. 1,004,916.) 40c.

19,400—ROASTING—Ofen zur sulfatisierenden Röstung kupferhaltiger Kiese Richard. (Chem. Ztg., May 21, 1912; 1 p.) 40c.

19,401—SURFACE COMBUSTION. (Engineering, May 10, 1912; 2½ pp., illus.) Lecture by W. A. Bone before the Cavendish Soc'y of Leeds University. 40c.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

H. D. McCaskey has been visiting quicksilver prospects in Nevada.

Frank J. Probert passed through New York this week on his way to Europe.

P. G. Lidner, of New York, has gone to Venezuela on professional business. He will be absent about two months.

M. L. Robb, of the Cerro de Pasco Mining Co., has been appointed U. S. consular agent at Cerro de Pasco, Peru.

Harold Kingsmill, formerly manager of the Rea mines, recently visited Porcupine, Ont., and has now returned to Peru.

Claude T. Rice, of the editorial staff of the JOURNAL, and Mrs. Emma R. Wood, were married in Chicago, June 22 last.

Professor Robert H. Richards, of Boston, was married on June 8 to Miss Lilian Jameson, of Jamaica Plain, Massachusetts.

Stephen Birch has been elected a director of the Braden Copper Co. in place of Edgar J. Meyer, who was lost on the "Titanic."

George I. Adams has been appointed professor of geology in the Pei Yang University, Tientsin, China, and will start for the East in July.

Charles Fergie is on a visit of inspection to the Pacific Pass, Western Coal, and Lethbridge collieries, of which he is consulting engineer.

V. F. Marsters left New York, June 28, to take a position with the New York & Honduras Rosario Mining Co., at San Juancito, Honduras.

C. E. Powers and C. W. Pocock have left the Cerro de Pasco Mining Co., and have gone to the Backus & Johnston Mining Co., at Casapalca, Peru.

William Davidson, well known as a successful prospector in the early days of the Porcupine camp, is now engaged in zinc mining in western Missouri.

H. A. Bakewell, of Goldthorpe, England, is making an inspection of properties in the Manitou gold area, Ontario, in the interest of English capitalists.

H. W. Kitson, formerly with the Ray Consolidated, is now superintendent of the Kornkob Mining & Developing Co., at Redington, Pima County, Arizona.

W. W. Mein has become the general manager and chief consulting engineer of the Canadian Exploration & Mining Co., and will make his headquarters in New York.

R. K. Stockwell has resigned his position with the Robins Conveying Belt Co., and is now chief engineer of the Braden Copper Co., at Rancagua, Chile, succeeding C. E. Rock.

H. P. Gordon, an experienced California hydraulic engineer, has been appointed superintendent of the Champs d'Or mines in the Seigniory Rigaud Vaudreuil, Beauce County, Quebec.

V. P. Walling, for 11 years chief engineer of the narrow-gage railroad of the Cananea Consolidated Copper Co., at Cananea, Mexico, has been appointed assistant engineer of the Chicago & Great Western R.R., Chicago.

C. K. Studley, of the California State Normal School, will engage this summer in geological research in Big Chico cañon in Butte County. Professor Studley will probably be assisted by members of the State University geological department.

George D. James, of Salt Lake City, has returned from an extensive investigation in Beaver County, Utah, in the interest of Eastern investors; the examination included mining and hydraulic possibilities for development of that county.

S. W. Traylor, president of the Traylor Engineering & Manufacturing Co., of New York, recently visited the Bishop Creek mine, Inyo County, Calif., for consultation with A. Del Mar, superintendent, regarding the mill construction and additional equipment.

Charles R. Miller, of Wilmington, Del., recently visited the Penn Copper mine at Campo Seco, Calif., for the purpose of inspecting the thiogen plant. Mr. Miller is president of the Thiogen Co. which has installed the Young process of neutralizing the fumes in the smelter smoke.

Louis Fenn Vogt, Pittsburgh metallurgist retained for the past year by the Vanadium Mines Co., of Cutter, N. M., and Pittsburgh, to develop new processes on the vanadium and other rare metal ores, returns to Pittsburgh about Aug. 1, upon successful completion of his work.

Dr. Ernest H. Angermann, whose death was reported by a correspondent in our issue of Mar. 2 last, writes to us from Clausthal, Härz, Germany, that he is still alive, and has been engaged all winter in France, on professional work. He expects to return to Mexico next fall to take up again his work as a mining geologist.

George J. Rockwell, for some time past, head of the Rockwell Engineering Co., of Denver, has been appointed general manager of El Tajo Mining Co. the San Sebastian district of Jalisco, Mexico. He succeeds Ferdinand McCann, of Mexico City, who recently resigned. Mr. Rockwell is widely known as a mining engineer and metallurgist, and as a successful manager, in the United States and in Northern Mexico.

Prof. J. Volney Lewis, of Rutgers College, expects to spend the greater part of the summer in the study of mining regions in the West. For the present he is busy with the publication of his new "Determinative Mineralogy," which is to appear in August. In general plan the book follows the well known Brush-Penfield treatise, but it is intended to meet the requirements for a less encyclopedic and therefore simpler and less expensive work. By the elimination of exceedingly rare minerals, the number in the tables has been reduced from 380 and the procedure has been greatly simplified.

OBITUARY

A cable from St. Petersburg, Russia, reports the death of F. Osmond, the distinguished authority on the metallurgy of steel and on alloys. He was an honorary member of the Iron & Steel Institute and a frequent contributor to its *Transactions*.

J. W. Mullin died at Sumpter, Oregon, June 21, aged 74 years. He was one of the best known mining men in the Baker City district. He went to Oregon in 1862 and was one of the first to work the mines of the Auburn district, not far from Baker City.

Richard Bryan died at Sumpter, Oregon, June 21, aged 55 years. He had lived in Oregon about 30 years, and operated several mines in the Alamo and Red Boy districts. His death was caused by miner's consumption. He was a widower and leaves a married daughter in Virginia.

Societies and Technical Schools

Canadian Electrical Association—The twenty-second annual convention was held at Ottawa, June 19-21 about 300 members being in attendance. The secretary-treasurer's report showed a total membership of 586. Among those who presented papers were J. G. Hennenger, of the National Electric Lamp Association. Prof. H. T. Barnes, of McGill University, and S. Bingham Hood, Toronto. The following officers were elected: President, R. F. Pack; vice-presidents, W. L. Adams and W. L. Bird; honorary secretary, T. S. Young.

National Fertilizer Association—A meeting of the Executive Committee was held June 7 and 8, at Cleveland, O., to perfect arrangements for the nineteenth annual convention of the association, which will be held at Atlantic City, N. J., the week beginning July 15. The Southern Fertilizer Association convention will also be held that week. Tentative plans were adopted for a most interesting and instructive program. Men widely known in national, state and commercial life will be invited to make addresses on subjects of interest to the fertilizer trade. The entertainment committee has arranged a program for the entertainment of guests, which was presented to the Executive Committee and unanimously ratified.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

June 26—A number of California miners have gone to and returned from Bolivia. Many of the California adventurers are reported to be stranded. They who have returned have only ill words to say of the promoters who induced them to go to Bolivia. It is admitted there are placer mines, which the natives work, and expect to earn not more than 50c. per day. One of the California men writes that the natives cannot be beaten at placer mining, but they will not work for others, nor will they give any information as to the situation of the placer mines. The fact is that the California adventurers were looking for big returns on small investments, and the promoters expected a larger crop of investors than has been harvested. Bolivia, like other fields, probably has gold, but it is not a poor man's country.

A regular meeting of the executive committee of the Anti-Débris Association, held at Sacramento, received reports from watchmen who made an inspection of the hydraulic mining territory. It was announced that an injunction had been served upon the companies operating mines in the vicinity of Camptonville. The Brandy City company, which operates two giants and works about 25 men, has erected dams which are declared insufficient to restrain the débris and tailings and this company has been enjoined. Considerable complaint is made that Yuba River shows the effects of the mining operations in the vicinity of its head waters and an extra effort will be made in this vicinity by the association. W. L. Irwin, superintendent of the Neocene Placer Mining Co., has filed an affidavit that after the present cleanup the operations by this company will cease.

Denver

June 27—Among the many more or less idle, but historic mines, which are being revived under the new era in Colorado, is the Bassick at Querida, Custer County, which for many years produced regularly. Now it is reported that lessees have found in the 200 level a body of ore assaying unusually high in gold and silver. A 20-ton carload has been taken out for shipment. The early success and development of the Bassick was largely due to Judge Hugh Butler, of Denver, who has been for many years a third owner in the mine; the pathetic side of this reported extraordinarily rich discovery is the fact that Judge Butler passed away today at St. Joseph's Hospital.

Dr. Victor C. Alderson, president of the State School of Mines, will issue a monthly pamphlet containing information as to the treatment of complex ores, and also a record of the work accomplished by the experimental plant just opened. These pamphlets will be distributed for the benefit of the mining interests of the state.

The mining revival has extended to Craig, in Moffat County, where the sands of the prairie and hills west of the Elkhead Mountains and north of the Yampa River, as far west as the Snake River, are known to carry gold in what would be paying quantities if water were only availiable; the latter not being the case in a large portion of the territory, the dry separating machines are receiving attention, and three different types of machines are being operated there by their inventors. The gold-bearing gravel and sands are not in the gulches, as is usual, but form the mesa or upland, and cover the entire country; although it would not be correct to state that the gold is uniformly distributed, it is certain that in order to recover the gold, the whole of the material will have to be handled, as it has been demonstrated that gold has been found at grass roots as rich as deeper down.

Butte

June 26—The Helena land office has received notice that several thousand acres of public land in Granite, Deer Lodge, Silver Bow and Beaverhead Counties were withdrawn from entry, June 10, on account of the presence of phosphates. This land extends from Township 12 North, Range 14 West, south to Township 1 South, Ranges 9 and 10 West; also from Range 9 West, west to Range 14 West, and is designated as Phosphate Reserve No. 12, Montana No. 3.

At the Badger State mine of the Anaconda company, an average of 700 tons of ore per day is being hoisted, and ore reserves at present are such that this amount could easily be doubled. Preparations are being made to install a new hoisting engine and skips to replace mine cars and double-deck cages now being used. Also a new steel headframe will be erected, as the present wood frame will not bear the additional strain of 4½-ton skips. In preparation for the equipment of the 1800-ft. level with electric motors for ore hauling, the wiring has been completed and heavy steel tracks, necessary for the running of motors, laid on the entire level. The Stromberg-Carlson mine-telephone system has been installed on all of the levels and at the surface buildings. On the 200-ft. level a diamond drill has been started, to tap the water in the workings of the old Moose mine adjoining the Badger State, which has been closed for years. The hole is being run to strike the end of an east drift on the 400-ft. level.

In the case of the British Butte Mining Co. *vs.* Shirley Jenks, of London, in which Jenks brought suit against the company for money loaned it which was never returned, judgment was rendered, by default, in favor of the plaintiff. By order of the court the gold dredge, constructed by the company at a cost of $100,000 some years ago, was sold at a sheriff's sale on June 24 for $1000 to Jenks. The large acreage of placer ground, owned by the company, and situated at Rocker, four miles west of Butte, was not included in the sale.

Salt Lake City

June 27—Producers of lead ore in Utah are benefited by the increase in the price of lead from $4.20 to $4.50 per 100 lb., which has occurred recently. The latter price was that prevailing prior to the agitation for the reduction of the lead tariff, and the passage in the lower house of the Underwood hill. Utah's production for 1911 was approximately 110,396,000 lbs. The 1912 output so far has been practically the same as that for the corresponding period of 1911, and the recent rise will mean an increase of about $200,000 to Utah producers for the second half of the year. The camps most benefited are Park City, Bingham, Alta, Tintic, Beaver County, etc. Lead producers are being urged to begin immediately on the compilation of statistics to be used in demonstrating the need of the existing tariff, to the next Congress, which it is thought may undertake a revision of the metal tariff schedules. With the recent rise in the price of copper, lead, and silver, increased activity in the local mining field is apparent, and Salt Lake mining machinery houses report a marked increase in business during the last two weeks. Much of the machinery is going into producing mines and some of it is being applied to new development work. A large amount of lumber and mining timber has also been sold to Utah buyers.

There are fewer idle miners in Utah and Nevada camps than at any time during the last two years. Copper producers are increasing their forces, and owners of zinc producing mines have the best market in several years, the price of the metal being high and facilities for the disposal of the ores good.

Negaunee, Mich.

June 29—Exploration continues active in the region from Lake Michigamme, on the western Marquette Range, southwest to the Amasa-Crystal Falls district of the Menominee Range, and from there through the Iron River district west into Wisconsin, south of the Gogebic Range. This territory, on which little systematic geological or diamond-drill work was done until recently, gives promise of developing some surprises in the line of ore finds. South and west of Lake Michigamme the Oliver Iron Mining Co., and the Jones & Laughlin Co. have been exploring for some time, their operations reaching as far south as Witbeck on the Chicago, Milwaukee & St. Paul R.R. and as far west as Fence Lake in T. 47 N.-R 31 W. From this region the Amasa-Crystal Falls district is not far distant, where the following companies are drilling: Oliver Iron Mining Co. in Sec. 9 T. 44 N.-R. 33 W., near the company's Michigan mine, and also two miles southwest of Crystal Falls near the Dunn mine; Pickands, Mather & Co. are likewise drilling in the same section near Amasa; the Iron Development Co., of Iron River, has been drilling for a year in Sec. 26, the same township; the Ladenberg-Thallman interests have two drills at work on Sec. 36 in that township, and have an immense area of land under option throughout the region; Corrigan, McKinney & Co. are drilling in Sec. 21 T. 43 N.-R. 32 W., one mile northeast of Crystal Falls.

Kingman, Ariz.

June 18.—The bill recently passed by the Arizona legislature, making mining claims subject to liens for work done on them by leasers or parties holding them under bond, is being viewed with considerable disfavor. There is some agitation regarding petitions for invoking the referendum. It is feared by those opposed to the bill, that under its provisions development work in the county will be greatly curtailed.

Last week three bars of bullion weighing 420 lb. avoirdupois and worth $90,000, were brought into Kingman by S. S. Jones, general manager of the Tom Reed mines. This was the production of 10 stamps during May. Active mining operations have been suspended there pending the installation of an electric hoist to replace the steam hoist now in use. At the same time improvements will be made in the shaft to facilitate hoisting. This company has purchased the Neglected group of mining claims, from which will be obtained an additional water supply sufficient to enable the operation of the 30-stamp mill at full capacity, after the other improvements are completed. The Gold Berg company was recently organized in Utah with James Rooney, president; J. T. Williams, secretary and Edward Wilkins, treasurer, and has taken over the group comprising the Gold Berg and other claims in the Squaw Peak section, northwest of White Hills. There is a 400-ft. tunnel on the property and it is reported that it has tapped a body of good ore. Further development work will be commenced soon.

Toronto

June 29—Prof. A. P. Coleman, of Toronto, has made an investigation of the Whiskey Lake area on the north shore of Lake Huron, where gold claims were recently staked. He reports that only one of all the locations, the Peyton claim, gives any promise of being valuable. It has a large showing of quartz carrying free gold, but no well-defined veins have been discovered. There are a number of low-grade copper deposits in the district.

An expedition to search for and work placer-gold deposits on Baffin's Island, in the Arctic Circle, is being organized by A. W. (Lucky) Scott, of Toronto, a former partner of F. Augustus Heinze. A ship of 300 tons' burden has been chartered, which will sail from St. John, Newfoundland, about July 10. Among the members of the party are S. Osgood Pell, of New York, Thomas Morrisey, of Nevada, Alexander Gillies and E. Holland, who have been engaged in mining in Porcupine, and Frank Vasser, a South American miner. The entire party, including the crew, will number 22. Capt. Robert Janes, who has made gold discoveries on Baffin's Island during the explorations made by the Canadian government SS. "Arctic," will accompany the expedition as guide and interpreter. The immediate destination of the expedition will be Pond's Inlet on the northern coast of Baffin's Island, across from Greenland. The vessel will carry provisions sufficient for two years, the party expecting to return in the summer of 1913.

Cobalt

June 28—The silver mines of northern Ontario have been receiving a great deal of attention lately, more real interest having been evinced in them than in any other mining district of the province. An interesting feature of this has been the development of the Casey-Cobalt and the Townsite mines which are the only two properties in the camp controlled entirely by English capital. They both sprang into prominence within a few weeks, the Casey having recently shipped the richest car of ore that ever left Cobalt. These two companies, the flotation of which was directly responsible for keeping a large amount of English capital away from Cobalt, are now both on a sound basis. There is a healthy activity throughout the whole district, and a number of mines which have been idle for some time are being worked as leases.

The report for the first three months of the present year gives some interesting figures as to production and values. The total output for the quarter was 7,439,044 oz., worth $4,092,405, compared with 7,530,487, oz. and $3,708,544 for the corresponding period of 1911. This shows a decrease of 91,433 oz. in production but an increase of $383,861 in value. Of the total production for the quarter, Gowganda produced 147,103 oz., an increase of 14,200 and South Lorrain produced 285,042, oz., an increase of 218,257 over last year. The total decrease from Cobalt alone was therefore 323,890 oz. The shipments for the quarter were: Ore, 4346 tons; concentrates, 2528 tons; bullion, 1,445,834 oz. Of the total quantity of silver 4,197,161 oz. were produced in Ontario smelteries, and adding the bullion produced at the mines, over 75% of the total yield of silver was treated in Ontario. For the first time in the history of silver mining in this province the total value of the shipments has exceeded $4,000,000 for three months.

Chihuahua

June 23—A slight betterment of mining conditions is apparent throughout northern Chihuahua since June 1, due to the regular supply of fuel and dynamite, and to the abundance of better-class Mexican miners. As a result, such companies as the American Smelting & Refining Co. and the Chihuahua Mining Co., in the Santa Eulalia camp, have increased working forces by more than 200 men, and consequently the production. There is also less unrest among the peons, the majority of them appearing anxious for a termination of the revolutionary disturbances, so that they may continue work undisturbed. Six furnaces are now in commission at the Chihuahua smeltery of the A. S. & R. Co., while a seventh is being made ready. The plant is now handling about 1400 tons per day. There is an abundance of ore coming in regularly.

According to late reports the larger mines and mills in the Parral camp have secured ample supplies from the south, since the government forces have opened the railroad from Mexico City to Jiminez, the main-line terminal of the Parral branch of the National Railways of Mexico. The Rio Plata Mining Co. is preparing to restart its mill at Guazapares, which has been out of commission over six months, pending the development work in the mine. Early in July the Yoquivo Development Co.'s cyanide plant will be in commission again after a 30-day shut-down, to permit of needed repairs and annual overhauling.

The Mining News

The Current History of Mining

Alaska

Fairbanks dispatches state that a new gold find has been made in Fox Gulch in the Innoko district.

Alaska-Treadwell—During May 84,280 tons of ore were crushed, yielding $191,590 gross and net $71,602. Operating expenses were $89,276, construction, $30,711; yield per ton, $2.30. Development work totaled 929 feet.

Alaska-Juneau—This company is driving a tunnel over a mile long to connect with the mine near the head of Silverbow Basin.

Alaska-Gastineaux—This company is about to drive a tunnel to the Perseverance mine, from a point near Sheep Creek, about three miles south of Juneau. This tunnel will be nearly two miles long and by laterals will tap the Sheep Creek mines belonging to the same company.

Bewick, Moreing & Co.—This company, of London, England, is exploring property at Auk, about 15 miles from Juneau.

Juallin—This mine, about 50 miles from Juneau, was recently reopened and about 90 men are at work.

Kensington—This mine is situated at Berners Bay, about 60 miles from Juneau, and, although a separate company, is under the same management as the Alaska-Gastineaux.

Mineral Creek Mining Co.—The company has taken over the Ramsey-Ruthford gold property, near the Valdez glacier. This property was under bond to Col. B. F. Millard and associates. It has at least $100,000 worth of ore blocked out.

Arizona

Gila County.

Needles—The Guggenheim interests have relinquished their option on this group of 27 claims, and the so-called independent group of 13 claims, situated three miles west of Miami and adjoining the claims of the Southwestern Miami and the South Live Oak companies. The option called for a total payment of $625,000. The ground was examined by five engineers at various times and orders had been placed for machinery and supplies for churn-drilling.

Copper Reef—At this mine, 12 miles south of San Carlos, good progress is being made in driving the California tunnel. The drift on the California vein is reported to be breasted in good vein matter. The pump installed at the new well is furnishing sufficient water for the mine and camp. M. J. Kennedy, of Pittsburgh, president, is visiting the mine.

Gold Needle—W. Sparks and Frank Thompson have acquired title to this old mine about one mile northeast of the Black Warrior, and will start work soon. The mine produced gold ore about 30 years ago and is opened by a shaft and 900-ft. tunnel, from which two winzes have been sunk. It is reported that a quantity of ore was mined from the oxidized zone and that the mine was abandoned when base ore was reached. The workings are badly caved and the new owners intend to clean out the tunnel and explore the property.

Inspiration Consolidated—The company is sinking three development shafts and one working shaft and is opening the Inspiration orebody by drifts and raises. The development of the Live Oak orebody will begin after the sinking of development shafts Nos. 1 and 2 is finished. The working shaft is being temporarily timbered with 8-in. timbers. After it reaches the desired depth it will be lined with concrete beginning at the bottom and working upward, removing the timbering as the concrete is poured in. There will be three compartments, each 5 ft. 11 in. x 5 ft. 6 in. and the concrete walls will be 10 in. thick. It is being sunk on contract, there being three shifts with six men on a shift. A 25 hp. gasoline hoist is being used for sinking. About 480 men are employed.

Miami—At the concentrator, additional rolls are to be installed in the crushing plant so that all ore will be reduced to ½-in. size before going to the bins. The new rolls are expected soon. They will be 15x42-in. spring rolls of unusually heavy construction, specially built by the Traylor Engineering Co. and will gradually replace all the rigid rolls now in use. The chilean mills will be replaced by Hardinge conical pebble mills. While the cost of steel and pebbles consumed by the latter is said to be about the same as that of steel for the former, the repair cost of the chilean mills far exceeds that of the Hardinge mills.

Iron Cap—F. A. Woodward, of Boston, vice-president and general manager, is inspecting the Iron Cap mine at Copper Hill, preparatory to resuming development work. The mine adjoins the Copper Hill mine of the Arizona Commercial and has been considerably developed but was closed down in 1910 owing to exhaustion of funds of the National Mining Exploration Co. The Iron Cap Copper Co. is virtually a reorganization of that company and is capitalized for 200,000 shares, par $10, of which 85,000 shares are outstanding, the rest being treasury stock. There is also outstanding a $50,000 bond issue. Mr. Woodward states that there is sufficient money in the treasury to carry on development during the coming year.

Mohave County

Several leasers are working on the Banner property in the Stockton Hill district and it is the intention of others to commence work soon on some of the adjacent properties in this section. Stockton Hill has been a productive district and the deposits of high-grade ore frequently found at comparatively shallow depths, make it an attractive field for leasing.

The San Pedro, Los Angeles & Salt Lake R.R. Co.'s recently completed branch to St. Thomas will open up a rich mining and agricultural section in that portion of Mohave County north of the Colorado River. Considerable copper ore is found in that region, but heretofore it has been impracticable to ship ore carrying under 40% copper. With better transportation facilities and the present price of copper, ore carrying 20% copper would probably show a profit.

Tennessee—It is reported that this mine, one of the United States Smelting, Refining & Mining Company's properties, will suspend active mining until the Santa Fe R. R. extends the tracks of the Chloride branch to the mine. It is expected that this will be done in about five weeks.

I. X. L.—This company is about to sink the main shaft another 200 ft. The property is in charge of Superintendent Atlee.

Frisco—A 24-mile telephone line has been completed by the Arizona, California & Nevada Telephone Co., from Kingman to these mines, by way of Union Pass.

Pinal County

Magma—At the old Queen mine at Superior, a shoot of high-grade copper ore has been opened on the 650- and 800-ft. levels. On the 650-level it was 150 ft. long and 5 ft. wide. On the 800-level it is from 5 to 20 ft. wide, and has been opened for nearly 300 ft. The ore from development work is being shipped and

averages from 20 to 25% copper and some silver. The copper occurs as chalcocite and bornite. The mine was taken over on the advice of Henry Krumb about two years ago by the Gunn-Thompson Co. which organized the Magma Copper Co. and started development work. Results have exceeded expectations.

SANTA CRUZ COUNTY

Austerlitz—W. R. Layne and Todd C. Woodworth are reopening this mine. A pump and hoist have been placed at the shaft and the latter has been unwatered. The shaft will be sunk deeper; four crosscuts are being driven from the tunnel and ore has been disclosed. The mill and mine, situated ¼ mile apart, have been connected by pipe line and tram. The mill is crushing ore. The ore is a copper sulphide, carrying gold and silver.

California

AMADOR COUNTY

Kennedy—The suit of H. D. Emerson for possessory right to the Bright claim, purchased by the Kennedy company for $20,000, has been dismissed on demurrer.

Bunker Hill—This is the only active producing mine on the Mother Lode in Amador County that employs the cyanide process for the treatment of tailings. It is also the first mine to employ auto trucks in this county.

Keystone—The main inclined shaft has been deepened to 1700 ft.; vertical depth, 1300 ft. From May 14 to June 23 the shaft was deepened 118 ft. A new 300-hp. electric hoist will be installed. C. R. Downs, Sutter Creek, is manager.

ELDORADO COUNTY

Beebe—This quartz mine, near Georgetown, has been taken over on bond by Bewick, Moreing & Co.

INYO COUNTY

Black Warrior—Shipments of ore are being made by pack animals from this mine on Big Pine Creek.

Gibson—The first shipment of ore in the Buena Vista district is being sent out from this property. Cass Gibson is leaser.

Skidoo—During May, 1209 tons of ore were milled yielding total receipts of $17,719 for the month. Development work cost $1504; operation, $7202; and net profits were $9013.

MONO COUNTY

Crystal Lake will be raised about 20 ft. by the construction of a concrete dam which will cost about $90,000.

MONTEREY COUNTY

King—A new Scott furnace will be installed at this quicksilver mine in the Parkfield district. Oil fuel will be used. G. W. Warner and W. Gray, of the Dominion Oil Co., Coalinga, are owners of the mine.

NEVADA COUNTY

Republic—This mine west of Graniteville has sufficient ore blocked out with which to operate the 10-stamp mill on full time.

Bald Mountain Gold Mining Co.—This company has been incorporated to acquire and operate the Hippert gravel claims above Graniteville.

Erie—This mine, four miles south of Graniteville, will drive a lower tunnel to intersect five veins and to prepare for mining and milling on a larger scale.

Gaston—This mine, south of the Erie, has completed its drainage tunnel and has sufficient ore blocked out to operate the 40-stamp mill night and day. Fred Moore is superintendent.

Blue Rock—A vein 4 ft. wide is reported to have been disclosed in this prospect at Cherokee. Charles Salmon is superintendent.

PLACER COUNTY

Red Bird—It is reported that telluride ore has been disclosed at this mine near Colfax. George Tubb is owner.

PLUMAS COUNTY

The old town of Prattville has been destroyed, the remains of the dead removed, and the site prepared for the storage reservoir of the Great Western Power Co., which is building the great dam near Nevis.

Snow fell at Portula on June 21. The precipitation was light, but covered the ground.

California and Utah men are said to be interested in developing some old properties near Doyle, on the Western Pacific Railroad.

SIERRA COUNTY

City-of-Six—This property has been bonded to J. W. Henderson, of Fresno, and work has been resumed.

Bellevue—Pay gravel is being taken out by a large force of men at this mine.

Sierra Standard—A wagon road is being built to this mine in Sailor Ravine by the recently incorporated company that is operating there.

Hewitt—At this property, near Gibsonville, the recently erected mill has begun crushing good ore from the vein 21 ft. wide.

Cleveland—Nevada men have bonded this mine and are putting the mill in condition for early operation.

SISKIYOU COUNTY

Jilson—The adjoining claim has been leased by J. E. Leary and A. B. Boseman, of Montana. A 5-stamp mill will be installed.

TRINITY COUNTY

An effort is being made to erect a modern custom mill in this district. There are a number of small mines and prospects in the vicinity that can furnish such a plant with considerable ore of good grade, but the ore will not bear the expense of shipment to outside points.

Trinity—At this group of mines a shipment of high-grade ore is being prepared for the smeltery.

Bonanza—Rich telluride ore was recently found, assaying 27 oz. gold per ton.

Golden Chest—The principal work is being done from the Mountain View claim. The mill is to be remodeled.

TUOLUMNE COUNTY

Confidence—The last cleanup at this old mine was made recently, and the surface equipment will be dismantled. All the accumulated ore was run through the mill and the sulphurets shipped. The extraction of ore has extended to the limit of exploration and development. This mine was located in 1853, and is reputed to have produced about $4,000,000 in gold. In the early working of the mine, the sulphurets were shipped to Wales, and returned a large profit. The mine is being abandoned through the indisposition of the present owners to expend money in further exploration.

Colorado

ASPEN COUNTY

Silver Cream—A discovery of 10-oz. gold ore is announced as having been made by H. Dickinson in the old mine on Castle Creek, above Ashcroft. The mine has not been worked for years. Excitement prevails and claims are being staked.

CHAFFEE COUNTY

Black Hawk—In this mine, about 2½ miles from St. Elmo, 14 in. of ore, carrying gold, silver, copper and lead, have been encountered. The mine is operated by the Atlas Leasing Co., of Denver.

CLEAR CREEK COUNTY

Alice Gold Mines Co.—It is reported that this property has been purchased by the Tonopah Mining Co., and that considerable money will be spent in development and a 500-ton mill built. This is said to be a $4 per ton, steam-shovel mine.

Humboldt—Two tables and a slimer have been added to the mill equipment.

Mineral Chief—Operations will be resumed soon at the mill and both company and custom ore will be treated.

Hudson—The remodeling of this custom mill is nearly completed. The process includes amalgamation, concentration and continuous cyaniding.

Golden Glory—Development will be resumed soon. A contract has been let to drive the main tunnel 500 ft. beyond its present length of 1000 feet.

LAKE COUNTY—LEADVILLE

Anderson—W. B. Anderson has returned from the East, and states that money is available to drive the tunnel ahead. The breast is now 550 ft. from the portal and in 300 or 400 ft. more will probably begin to intersect a series of veins which have been mined from the surface down.

Ponsardin—The lessees have opened several streaks of carbonate-of-zinc and lead ore at the 300-ft. level and expect soon to reach the main orebody.

Result—Lessees are shipping a car per day of good iron ore, carrying silver and lead.

Denver City—The lessees are repairing the drift to the north from the 300ft. level and will drive in the direction of the old Blaine shaft, hoping to open a body of zinc ore. Meantime the lessees are hoisting good-grade excess iron ore, carrying 20 oz. of silver per ton.

Helena—At this mine in Iowa Gulch, milling experiments are being made with the installation of Hartz jigs and a 16x28-in. Davis roll. Ore from the third, fifth and seventh levels is keeping the plant running steadily.

OURAY COUNTY

Wanakah—It is reported that 8 ft. of high-grade smelting ore have been opened north of the porphyry dike. Hitherto the orebodies have all been found south of this dike. The ores are chiefly magnetite and pyrite, with occasional chalcopyrite.

SAN JUAN COUNTY

Taylor and Elston have found tungsten ore in an abandoned property which they located in Prospect Basin.

Clevenger—The strike made on this property at the head of South Mineral Creek last autumn, has been developing steadily and some rich ore carrying copper and silver has been encountered. Extraction and sorting of ore has begun but shipments have been held up by the poor condition of the roads.

Esmeralda—A rich strike of gold and silver ore is reported to have been made at this mine in Minnie Gulch. The mine is owned by the Edward Ruth Mining Co. The excitement is great.

Hamilton—The mine, near Midelton, will be operated from the lower tunnel, which will develop the copper and lead-ore vein 1300 ft. below the surface, under the superintendence of Isaac Hughes, and Etienne Ritter, consulting engineer.

SAN MIGUEL COUNTY

Black Bear—The tramway between the mill in Ingram Basin and the loading station at Pandora will be rebuilt. Timbers for the new tramway towers are framed and ready for erection. A new 125-gal. boiler has been installed to unwater the main shaft.

Suffolk—The mill at Ophir is being overhauled and remodeled. Cyanide treatment is being added.

Jim Crow—The company will soon commence the construction of a boarding house to accommodate 35 men and will install additional mining equipment. T. E. Thomas is manager.

Blue Flag—The concentrator at this mine, in Upper Illinois Gulch, is running steadily on ore from the mine, and regular shipments of high-grade silver-lead concentrates will be maintained.

TELLER COUNTY—CRIPPLE CREEK

American Eagles—The mine is producing about 12 cars of ore per month from the 11th level.

Wonder Gold Mining Co.—Operations are to be resumed at once on the Irish Mollie, on Gold Hill, by W. R. Foley, general manager. The 1000-ft. shaft will be sunk to the new water level.

Moon Anchor—Operations have been resumed on this old producer, on Gold Hill, and ore is being shipped.

Jolly Tar—This mine is reported sold to Charles Walden, of Victor, who represented outside men.

Resurrection—The output from No. 1 mine is from 15 to 18 tons per day, carrying about 1 oz. gold per ton, with some silver.

Portland—No. 2 shaft is being sunk to the 1600-ft. level, where laterals will be driven to open the orebody now being mined on the 1500. Between 125 and 150 tons of ore per day are being received at the mill at Colorado Springs, and about 300 tons per day are being treated at the mill at the mine at Victor.

Idaho

BLAINE COUNTY

Sam Allen Mining Co.—This company is operating the Parker group. A compressor has been installed and power is received from the Idaho Consolidated Mines Co. hydro-electric plant. About 15 men are employed under I. E. Rockwell, manager.

Hidden Treasure—The mine has installed a compressor and is searching for a vein below the exhausted orebodies. A. B. Menken is superintendent.

J. P. P. Co.—Work is being done on a new tunnel, to open the orebody at a depth of 150 ft. below the present workings. G. U. Lee is superintendent.

BOISE COUNTY

Boston-Idaho—Both dredges are working to capacity.

Golden Age—This mine at Grimmes Pass has sufficient ore blocked out to run the 15 stamps for the summer season.

Gold Hill—This mine at Quartzburg continues to run its 20-stamp mill and has recently found good ore on the 500 level. E. E. Carter is manager.

National Mining & Development Co.—Work has been commenced on the Mountain Chief Mine; the road is about completed and a small mill will be installed this summer.

COEUR D'ALENE DISTRICT

Hunter—The Ryan stope at this mine has been cut by the crosscut from the 400-ft. level and some good ore has been found. The vein contains from 4 to 6 ft. of galena, running from 40 to 45% lead and 45 to 50 oz. silver, besides a good width of milling ore, assaying 7 to 8% lead and 10 oz. silver. During May, about a car of concentrates per day has been shipped. A picking belt has been installed and has proved successful; several cars of crude ore have been shipped to the smeltery.

Michigan

COPPER

Osceola—Production at the old mine is confined to No. 6 shaft, where there are eight drills in operation and a rock tonnage of about 250 tons per day is being handled. No. 5 shaft will start operations soon.

Mayflower—No. 18 drill hole has been discontinued at a depth of about 1910 ft., without revealing the copper formation that was cut in the No. 16 hole. The drilling outfit has been moved to a new site about 150 ft. distant.

Ahmeek—Preparations are being made at shafts Nos. 3 and 4 for the erection of the new steel shaft house. A portion of the temporary wooden building has been removed, but the erection of this new steel structure will not interfere with the hoisting of the rock coming from sinking, so that development work can be carried on without interruption. A new boiler house and engine house are under construction. The stock pile accumulated during the early operations on the conglomerate lode, is being removed and the rock sent to the mill. No. 1 shaft is down to the 18th level and No. 2 is sinking below that depth.

Allouez—The steel shaft house at No. 2 shaft is about completed and it is expected that the large skip will go into commission in the south compartment about July 1. There remains the skip road to be put in from the collar to the dump in the north compartment to accommodate the large skip. This shaft house is equipped with one dump, each skip dumping on a common movable apron which will feed the rock to one 24x48-in. crusher. Sinking is to be resumed at No. 1 shaft below the 18th level, where it has been bottomed for some time.

Tamarack—The adjourned meeting of this company was held recently and it was voted to sell the two-head mill on the shores of Torch Lake to the Lake Milling, Smelting & Refining Co. This

is a portion of the milling arrangement that was proposed some months ago by the Calumet & Hecla management, which controls this property.

Mohawk—No. 6 shaft tributary to the Ahmeek northern boundary is down about 1000 ft. and is developing a grade of rock that will eventually increase the production of the mine, as the ground tributary to this shaft has been practically proven by the developments in the northern portion of the Ahmeek mine.

IRON

The Board of Review, in Ishpeming, has approved the assessment of mines within the city limits for the payment of 1912 taxes. The mines have been given a reduction in valuation of 10% from the figures of 1911. The reasons for the reduction are the shipment of ore from the mines and the consequent loss in ore blocked out.

Wickwire—The Chicago & Northwestern Ry. has let a contract to A. D. MacRae, of Palatka, to build 1½ miles of track to this mine at Iron River.

Lake Superior Iron & Chemical Co.—This company, operating six charcoal pig-iron furnaces in upper Michigan and Wisconsin, is purchasing iron ore from independent companies, as its Yale mine at Bessemer does not supply sufficient ore. A purchase of low-grade ore was recently made from the Breitung companies, which will be shipped by rail to the furnaces. The furnace and chemical plant at Manistique has been placed in commission.

American—The foundation for the concentrator is finished; the low-grade ore to be treated will constitute only a portion of the mine's output and will be mined with the better-grade ore; it is estimated that 40% ore, situated conveniently for mining, can be handled cheaply without much increase of overhead expenses.

Montana

BUTTE DISTRICT

Anaconda—The water in the Moose mine stands about 12 ft. above the 300-ft. level, and after it has flowed out through the drill hole now being drilled, to the height of its mouth, it will be pumped out the additional 20 ft., after which an inspection will be made of the Moose shaft for the purpose of repairing it for operations. To care for the increasing supply of timber an addition to the timber yard has been graded. The building containing the mine offices and miners' change rooms, has been found to contain inadequate space for the increase of business, and it has been decided to double the size of the building. The foundation is being laid and the work will be rushed.

Butte-Alex Scott—For the year ended May 31 the company showed a net profit of $19,584. A total of 25,756 tons of ore. worth $15.14 per ton, were mined. The cost of extraction, including mining, development, construction, and supplies, etc., amounted to $131,546 or $5.17 per ton. Total receipts from sale of ore were $151,131 leaving a profit on the year's operations, of $19,584.

East Butte—An average of about 1,400,000 lb. of copper per month is being mined and smelted at present, and net earnings are about $100,000 per month. During the year ended June 1, 1912, 94,532 tons of ore were mined, yielding $16.51 per ton, the gross yield being $1,560,660. The total mining cost amounted to $407,451, or $4.31 per ton. Smeltery costs came to $463,857 at a treatment charge of $4.91 per ton. Costs for freighting, selling, etc., amounted to $225,288; surface and mine equipment worth $11,795 was installed, making total expenses $891,226 and $250,187 net earnings.

La France—The Lincoln Trust Co., of New York, according to reports, has instituted suit against this company, to foreclose a $2,000,000 mortgage on which interest has been defaulted. The mortgage covers all property of the company, including the Lexington mine, and Basin Reduction Works.

DEER LODGE COUNTY

Hidden Lake—At a meeting of the company in Anaconda June 20 the following officers were elected: Patrick Cuddahy, president; W. A. Law, vice-president; R. R. Robinson, treasurer; T. L. Cullen, secretary; directors, W. C. Ahern, L. D. Robinson and P. J. Dooley. The north crosscut on the 50-ft. level has penetrated a 33-ft. vein, of which 16 ft. is good gold ore. The property is producing steadily, and the last three cars shipped, averaged $27 per ton. A cyanide mill and chilean crushers will be erected this autumn.

GRANITE COUNTY

Royal Basin—Active operations are being carried on at the property near Flint. The mill is being operated steadily. Plans are being laid to install electrically driven machinery in the mill, the power to be obtained from a contemplated extension of the Great Falls Power Co.'s line from Phillipsburg.

Copper—Supt. John D. Fields, of this mine in the Princeton district, has miners at work and is hoisting ore regularly. Plans are being made to construct a road direct from the mine over the hills to Phillipsburg.

JEFFERSON COUNTY

Assets Gold Mining Co.—The 5x7-ft. tunnel, in granite, is progressing at the rate of 11 ft. per day. Electric power has been installed. The property is being operated by Colin McIntosh.

LINCOLN COUNTY

J. J. Hibbard, who owns an interest in gold-quartz claims in the West Fisher district, has purchased a two-stamp mill, which will be erected on the property.

Vermilion Silver & Lead—The company expects to ship ore July 1 from the mine near Silver Butte, 40 miles south of Libby. The company has a vein about 7 ft. wide, in which is a vein of shipping ore about 20 in. wide, containing gold, silver and lead. There is no mill.

Nevada

COMSTOCK LODE

Crown Point—Shipments to the Yellow Jacket mill last week included 680 tons of ore and about 400 tons were stoped on the 1400-ft. level. The ore from No. 2 stope averaged about $13 per ton. East crosscut No. 1 on the 1400, is 294 ft. in porphyry and quartz stringers.

Ward—A Starret pump has been ordered to reclaim the shaft from the 2100 to the 2475 station, which was flooded three weeks ago. It is expected to accomplish this within two weeks. The pump is air driven.

Consolidated Virginia—The three-compartment raise from the 2400-ft. level has been connected with the 2300 workings, and the third compartment is being carried up to the point of connection. This connection will facilitate ventilation. The company has closed a five-year contract with a California smelting company to treat all concentrate and shipping-grade ore at a rate said to be less then formerly.

ESMERALDA COUNTY

Lone Star Consolidated—Sinking is being done with two shifts of miners and the shaft is 200 ft. deep. The bottom is in dacite and developments are expected after 300 ft. depth. Crosscutting and drifting will be done from the 250-ft. point.

Goldfield Treasure—T. E. Joseph has secured a two years' lease and bond on this property, three miles northeast of Goldfield. Miners are at work.

Goldfield Consolidated—The large body of quartz recently encountered on the 1300-ft. level of the Grizzly Bear shaft, carries low-grade gold and silver ore, and some copper. The concrete foundation is practically completed for a double-drum electric hoist that will be installed soon.

Jumbo Extension—It is reported that the company will soon commence the repair of the Bonnie Claire 20-stamp mill 38 miles south of Goldfield, upon which it has obtained a year's lease.

Silver Pick Consolidated—Drifting east is in progress from the 262-ft. level. Development is also underway at the Webbfoot claims in the Gold Mountain district, where a shaft in the foot wall of the smaller vein is 150 ft. deep.

Florence-Goldfield—Superintendent Dewey has ceased raising on the rich ore recently encountered on the 250-ft. level, and an attempt is being made to find this orebody on the 350-ft. level. The main shaft is about 1130 ft. deep.

HUMBOLDT COUNTY

Hunter—Gold and silver ore is reported to have been found recently in a 3-ft. vein, assays from which gave $300 per ton.

Mines Development Co.—The company is doing extensive development work at the properties on Juniper Mountain. The veins which carry copper, gold and silver, are found in a large batholith of coarse-grained granite. It is said that a hoist will soon be installed, good for a depth of 1000 feet.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended June 20, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,450	82,919
Tonopah Belmont	1,800	50,726
Montana-Tonopah	1,054	25,483
Tonopah Extension	1,004	24,181
West End	690	17,654
Midway	.....	180
MacNamara	472	9,132
North Star	.....	80
Totals	8,470	210,355
Estimated value	$211,750	.....

Pioneer Consolidated—This company, of Pioneer, of which W. J. Tobin is general manager, will erect a 10-stamp mill plans for which are being drawn.

Halifax-Tonopah—This Tonopah company, of which S. H. Brady is manager, is preparing to install new equipment, comprising a 150-hp. electric hoist, a 120-ft. steel gallows-frame, a 10-drill compressor plant and pumping plant.

MacNamara—The clean-up at the mill for a 15-day run, resulted in the shipment of 900 lb. of bullion, worth $10,800 from 1010 tons of ore.

West End Consolidated—The company has added to its mill four Callow cones and 12 Deister concentrators to treat the higher-grade ore being mined, increasing the capacity to 120 tons. The mill comprises 20 stamps, two tube mills and Trent agitators and now treats 100 tons per day.

Tonopah Extension—The main oreshoot on the 400- and 500-ft. levels of the South vein, has been shown to be 240 ft. long and from 14 to 36 ft. wide.

Tonopah Merger—This company recently made a discovery, said to be the most important in two years. The Golden Anchor shaft at a depth of 935 ft. struck a new and unknown vein, 30 ft. between walls, 14 ft. of which is solid ore averaging over $30 per ton. The position of the discovery is 900 ft. northwest of the extreme western workings in the district. John Kirchen is manager.

Tonopah-Belmont—In a south crosscut on the 900-ft. level the company has opened a foot-wall branch of the Belmont vein, 5 ft. wide of good ore. The drifts on the vein on the 13th level continue to open good ore. During the quarter ended May 31, total receipts were $855,848; mining, milling and administration, $450,825; net income $414,141. Available resources were $1,111,856 on May 31.

Mizpah Extension—The raise in ore on the 1000-ft. level shows a width of 3 ft., averaging about $80 per ton.

New Mexico

SOCORRO COUNTY

Ernestine—The bullion product for the first 10 days of June amounted to 11,300 oz. of gold and silver; concentrates for same period, 5½ tons. The daily ore treatment continues at more than 100 tons. A new triplex, electrically driven pump has been installed in the mill to handle the battery solution, replacing the old steam pump.

Deadwood—The mill is handling an average of 60 tons of ore per day; 4375 oz. of gold and silver bullion were produced for first 10-day cleanup in June, with approximately 2½ tons of concentrates.

Oaks—Pacific mine development is yielding about 40 tons of mill ore per week. The tunnel is in 510 ft., where the vein shows 8 ft. wide of good-grade ore.

Deep Down—The leasers are constantly increasing the tonnage taken from south stope. The grade thus far has been above the average of the mill ore in the camp; it is sent to the Deadwood mill for treatment.

Oregon

JOSEPHINE COUNTY

Greenback—H. L. Willson, of Grants Pass and Glendale, with Dr. J. F. Reddy, of Medford, have purchased this mine, a producer. The new owners will install a mill.

Wade—C. E. Wade, owner of this mine on Williams Creek, has sold his three claims for $10,000. They are well developed and are good prospects.

Afterthought—J. R. Baily, owner of this mine on Thompson Creek, has sold out to R. E. Doan, of Los Angeles, Calif., and H. Silver, of Medford. The ore is free milling.

Golden Drift—A. J. McCorkle, manager, has returned from the East, where he ordered a complete milling plant for this mine, 12 miles north of Grants Pass.

Almeda Consolidated Mines Co.—Judge Bean has appointed Robert Tucker as receiver, on application made by Mr. Williamson and Mr. Montague, of Dayton, Ohio, on behalf of clients. The company was incorporated in 1905 to engage in the general mining business. Dr. L. A. Kent, 770 East Yamhill Street, Portland, an old stockholder, says that the management has done development work, including about 7000 ft. of tunnels, crosscuts and shafts besides installing a 100-ton smeltery.

Utah

BEAVER COUNTY

Moscow—Ore running $1500 per car is being shipped.

Red Warrior—Shipments are being made, and the property is reported to be in good condition.

Majestic—Two cars of ore were marketed recently, the net returns from which were $8.64 per ton.

Indian Queen—A renewal of the lease, which expired June 23 has not been granted. As yet plans for future development have not been given out.

Rob Roy—Good gold ore has been opened in a drift under old workings.

Cave—A bond and lease has recently been taken by E. P. Kesler and other Beaver County men, on this property a few miles southeast of Milford.

JUAB COUNTY

Eagle & Blue Bell—The output for the week ended June 21 amounted to seven cars. Two cars of ore have been marketed from the new find on the 700-ft. level, each of which brought between $5000 and $6000.

Chief Consolidated—Thirteen cars were shipped the week ended June 21. There is a good surplus in the treasury, and monthly earnings of several thousand dollars are being made. The April receipts amounted to $8000, those for May being somewhat less.

Scranton—Work was delayed the beginning of the last week, on account of a slight accident to the 50-hp. gasoline engine. Considerable development is being done. An incline drift is being driven from the main tunnel level. Shipments for the week ended June 21 were two cars.

Eureka-Swansea Extension—The operation of the new electric hoist has begun, and work has been started in the east drift on the 400-ft. level.

Utah—The average monthly output from this mine at Fish Springs is given as 40 tons of ore, bringing $80 to $100 per ton. Three teams are hauling ore along the 75-mile wagon road to Oasis at a cost of from $12 to $15 per ton. During the 21 years the mine has been in operation $281,000 have been paid in dividends. The last dividend was paid a year and a half ago. The company has lately acquired the Last Chance claims.

Emma—There is a car of ore sacked at this property south of the Utah, awaiting shipment as soon as teams can be procured.

Gemini—About $8000 have been distributed among the leasers for ore marketed during May.

Lower Mammoth—Ore is being followed on the 1000-ft. level. A recent assessment will probably bring in about $10,000, to be used for further development.

Tintic-Delmar—Work has been resumed at this property in North Tintic.

PIUTE COUNTY

Bully Boy & Webster—The building for the new mill has been completed and the machinery is being installed. It is expected to begin operations Aug. 1. About 100 tons per day will be treated. The management estimates the amount of ore at present broken down and blocked out above the lower level to be sufficient for maintaining operations two or three years. Drifting is being done on the lower level, and the work is in ore.

SALT LAKE COUNTY

Utah Consolidated—Average daily shipments of 600 tons of copper and lead ores are being made.

Bingham Copper—The debts of this company are being met, and plans for reorganization considered. A large percentage of the stockholders have deposited their stock, as requested, together with the assessment of 5c. per share, recently levied.

Bingham Mines—About 100 tons of lead ore per day are being shipped. The old Yosemite No. 1 mine is being reopened, and the shaft has been sunk to the 800-ft. level. Raising is being done from the Mascotte tunnel to connect with the old workings.

TOOELE COUNTY

Consolidated Mercur—The company is treating 400 tons of ore per day. About 45% of this tonnage is base, and two roasters are being operated. There are employed in mine and mill about 215 men. The company recently announced that its mines would probably be worked out before the end of the year, and that they would be shut down. Underground developments have been disappointing. A lessee is working in the silver vein, which underlies the gold veins, and on June 14 shipped a car of silver ore.

Franklin Leasing—This company has a lease on the old Geyser-Marion mine, and is building a new cyanide plant. The ore is low grade, but it is expected that both mining and milling can be done cheaply. The ore will be dry-crushed in a rock-breaker and rolls, and classified in solution, with Consolidated Mercur mixer-classifiers and Dorr classifiers. The sand will be leached, and the slime settled in plain tanks, and filtered by an Oliver filter. Zinc-dust precipitation will be used. The plant will be ready to start about Aug. 1. T. H. Franklin, mill superintendent of the Consolidated Mercur Gold Mines Co., is at the head of the company.

Wyoming

Reports are being circulated of several rich gold discoveries on the east side of Medicine Bow Range, in the vicinity of the Victoria mine. At the New Rambler, ore is being stoped from a 7-ft. vein, carrying platinum, copper and gold.

Philippine Islands

Guamas—The New York Engineering Co. is installing a dredge on this placer property in the Paracale district, and expects to have it at work in August.

Surigao Gold Mining Co.—This company has acquired title to 30 gold placer claims, comprising 1664 hectares of land, in the Causuran district, Surigao Province, Mindanao Island. The property is 16 km. from the town of Surigao, and covers an old river channel which has been worked by native methods for some years. The company is prospecting the ground by ditching.

Umeari Gold, Ltd.—This company, organized in Sydney, N. S. W., has bought the property of the Umeari Syndicate, which includes 1600 acres of gold placer ground on the Umeari River in Tayabas Province, on the East coast of Luzon. The ground has been prospected by boring, and the new owners purpose installing two dredges as soon as possible.

Canada

BRITISH COLUMBIA

Granby—During May the mine shipped a total of 103,974 tons of ore, an average of 4159 tons per day. Development included: Raising, 264 ft.; drifting, 528; sinking, 25; and diamond drill holes, 1247 ft. At the smeltery ore was received from the following mines: Surprise, 1062 tons; North San Poil, 224; Republic, 32; Snowstorm, 602; Sunday, 19; total 1939 tons. During the month 106,313 tons of ore were treated, of which 103,174 tons came from the Granby mines, and the balance from outside sources.

ONTARIO-COBALT

Jackson—This property near North Cobalt is being examined.

Buffalo—Ground has been broken for the erection of a refinery capable of handling the entire output of the mine. The process employed at the Nipissing will be adopted, with some modifications.

Ophir—Active work has been carried on since May 1, on a new shaft at the south end of the property, in which three large veins have been encountered, showing milling ore. Development in No. 1 shaft will be resumed.

Wettlaufer—The new mill is completed and in successful operation, the tailings being reground in Huntington mills and treated on slime tables, which produce from 1½ to 3 tons of concentrates per week, assaying from 600 to 2000 oz. of silver per ton. This process has not been adopted by any of the other Cobalt mills.

Temiskaming—The shareholders of this company have voted by a large majority to retain the controlling interest in the North Dome property at Porcupine.

ONTARIO-PORCUPINE.

Crown Chartered—The main vein has been cut in the crosscut from the 200-ft. level.

Preston-East Dome—This company is driving a long crosscut to explore the contact between the quartz porphyry and Keewatin.

Plenaurum—Another rich discovery has been made on this property.

Scottish Ontario—This property is being examined by prospective purchasers.

Hollinger—This company's mill is now running at full capacity.

Porcupine Gold—The new mill has been started and is giving excellent satisfaction.

Porcupine Lake—This company will start sinking in order to develop the veins under the lake.

McIntyre—Work on the construction of the new mill has been suspended.

Dome Extension—The annual meeting was held on June 28. The financial statement for the year ended May 31 showed cash in hand, $19,050; unpaid payroll, $3712; treasury stock, 199,993 shares. Capt. H. C. Anchor, superintendent, reported development work amounting to 2277 ft. to June 21, and stated that 30,000 tons of ore could be safely figured on from the 100-ft. level, while if the ore continues to the 200-ft. level the mine would have 40,000 tons more, running according to sampling, $5 per ton. In addition there are 3000 to 4000 tons partially developed in the west drift on the 200-ft. level in No. 1 shaft, which assayed $7 per ton. He recommended sinking to 500 ft. where the best ore was found by the diamond drill.

Mexico

According to press dispatches, orders to forfeit all property which has been abandoned by its owners, now refugees in the United States, or on which the taxes have not been paid to the rebel government, were issued by Gen. Pascual Orozco, Mexican rebel chief on June 27. The property, including mines, is to be worked by the rebel government for the benefit of the revolution.

South America

CHILE

According to a cable dispatch to the *Sun* a huge new deposit of iron ore has been discovered in the province of Coquimbo.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, July 2—The coal trade in the West begins to show a little improvement. Consumers are more inclined to put in stocks and operators are hopeful of better trade after the holidays. In the East the bituminous trade continues very dull and sales are not heavy. The anthracite trade is improving. Dealers are putting in stocks more largely in the domestic sizes, while the demand for steam coals continues good. The collieries are improving in output and after next week will probably be running up to full capacity.

A report comes from Pittsburgh that five large independent companies operating in that district will soon be consolidated into one company with a capital issue of $30,000,000. The companies named are the United Coal, the Pittsburgh & Westmoreland, the Pittsburgh-Buffalo, the Youghiogheny & Ohio and the Carnegie Coal Co. Several smaller companies and the Carnegie Dock Co. will also be included.

United States Foreign Trade—Imports of coal and coke into the United States five months ended May 31, long tons:

	1911	1912	Changes	
Anthracite	.....	29	I.	29
Bituminous	617,110	621,550	I.	4,440
Coke	40,341	32,519	D.	7,822
Total	657,451	654,098	D.	3,353

Canada furnished this year 550,208 tons of coal and nearly all the coke; Australia, 63,029 tons of coal.

Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, five months ended May 31, long tons:

	1911	1912	Changes	
Anthracite	1,365,470	829,484	D.	535,986
Bituminous	4,266,575	5,045,030	I.	778,455
Coke	416,919	344,884	D.	72,035
Bunker coal	2,710,434	3,151,318	I.	440,884
Total	8,759,398	9,370,716	I.	611,318

The bunker or steamship coal is practically all bituminous. Canada took this year 3,741,405 tons of coal; Cuba and the West Indies, 824,406; Mexico, 152,193; Panama, 199,139 tons.

German Coal Trade—Exports and imports of fuel in the German Empire, four months ended May 31, metric tons:

	Exports	Imports	Excess	
Coal	10,542,325	2,114,911	Exp.	8,427,419
Brown coal	18,952	2,430,487	Imp.	2,411,534
Coke	1,696,776	171,935	Exp.	1,524,841
Briquettes	865,789	64,610	Exp.	801,175
Total	13,123,842	4,781,943	Exp.	8,341,899
Total, 1911	10,513,273	5,779,810	Exp.	4,763,463

The exports this year included 6900 tons of coke to the United States.

Iron Trade Review

New York, July 2—The second half of the year opens with conditions almost unprecedented for midsummer. The mills are all busy and not only that, but most of them have work enough on hand to carry them well over into the fall. New business has not been large for the last week and that is the only sign of summer conditions. Many people, however, think that there will be quite a rush of now orders after the holiday. The usual stoppages for repairs at the mills will be postponed as long as possible.

Specifications for finished-steel products were heavy throughout June and particularly in the closing week, partly by reason of many low-priced contracts expiring, the mills being committed to a policy of canceling any unspecified tonnages at the close of the contract. Specifications will doubtless be light this month, but of actual business the mills are believed to have a larger tonnage on books than ever before, so that a quiet period is faced with equanimity.

The advance of $1 a ton in bars, plates and shapes announced by a majority of mills as effective June 26 has become universal, the market being squarely on the basis of 1.25c. for bars and 1.30c. for plates and shapes, Pittsburgh. Hoops and spikes have similarly moved up $1 a ton.

Pig iron orders continue to come in. The demand in the Central West is mainly for basic, and prices of that description of iron are firmer. Foundry iron is being taken quite actively in the East and some large orders are noted.

Railroad buying has been good. The tonnage of rails taken in June is estimated at about 200,000. Equipment orders have also come in during the last few days, a number of steel cars having been placed and also a number of locomotives, including 40 for export to Japan.

The weak spot in the trade is the uneasiness of labor. There is a demand for more men and those who are at work are evidently inclined to be discontented. It looks very much as if small concessions would be made to avoid strikes. The Steel Corporation has published a statement showing how much it has done for its labor, and this is evidently timed to meet the prevailing discontent.

Bar Iron Scales—The scale signed by the Western Bar Iron Association with the Amalgamated Association, in effect in the iron mills as far west as Newport, Ky.; East Chicago, and East St. Louis, gives the puddlers, under the present sliding-scale basis, $5.70 a ton instead of 5.37½, the rate paid during June, the scale being raised from $5 to $5.25, with 15c. instead of 10c. graduations, as heretofore. In the settlement by the Pittsburgh and Valley district manufacturers with the Sons of Vulcan, the insurgent puddlers' union, the men obtained the concession of a flat rate of $6 for puddling, with the abrogation of the sliding scale, under which the wage rose and fell with the price of bar iron. The sliding scale has been an institution in the bar-iron trade for over 25 years.

Baltimroe

July 1—Exports for the week included 1,233,800 lb. steel rails and 106,408 lb. track fastenings to Havana. Imports included 6,200 tons iron ore from Cuba.

Birmingham

July 1—A buying movement is looked for in the near future in the Southern pig-iron market. Quotations are firm at $11.25 per ton, No. 2 foundry, immediate delivery, with $11.50 asked for last quarter; some asking $12. Sales have been made on the $11.50 basis and inquiries in hand indicate there is going to be a steady demand. The production in Southern territory is disturbed right now by the blowing out of furnaces of the Alabama Consolidated Coal & Iron Co., now in the hands of receivers, but announcement is made that within the first 10 days in July the Woodward Iron Co. will be able to put two stacks in operation. Two of the iron companies in the South are out of the market so far as immediate-delivery iron goes.

The home consumption of pig iron is steady, with promise of improvement in two or three directions. There will be a larger melt in the near future for cast-iron pipe. Machine shops and foundries, too, report a little improvement in the trade.

There is no change in the steel situation. The Southern Iron & Steel Co. has a blast furnace at Gadsden in operation with several departments of the steel plant at that place going. There is a fairly good demand for the products and no loss of time is anticipated this month.

The plant of the Tennessee company at Ensley will hardly shut down this month. Orders for more than 13,200 tons of rails have been received during the past week.

The scrap-iron market shows strength. Charcoal iron sells at $22@22.50 per ton.

Chicago

July 1—General conditions in the iron and steel market are but little changed; pig iron is in light and manufactured products in heavy demand. The pig-iron market indeed has flattened out, orders being for very small lots, with here and there an inquiry that stimulates interest in selling agents. Yet prices are firm and everybody seems to be content to await developments. It is evident that the melters are running on as small a basis of raw material as possible. This, of course, is not surprising at this season, when foundry production ordinarily is at a minimum.

In carload lots chiefly, for delivery within one to three months, Northern No. 2 pig iron brings $14.50 and Southern No. 2 brings $11.50 Birmingham, or $15.85 Chicago, Lake Superior charcoal iron sells for $15.50@16. Sales for last half requirements are rare. Almost all orders are for delivery one to three months hence.

In the finished goods market, there is large buying. Structural material has a considerable sale for use over a wide range of territory. Railroad materials continue in very good demand. Bars are strong with local mills taxed to their limit of production to meet the demand; iron bars sell for 1.25c. and soft-steel bars for 1.38c. Plates, sheets and wire products are firm. Conditions of the market cause general expectations of heavy buying.

Cleveland

July 1—Ore transactions are small. A few furnaces have been trying to fill out their stock.

Pig Iron—The market has been quiet so far as new business goes. Quotations, Cleveland delivery, are $15.15 for bessemer, $13.75 for No. 2 foundry, $13.25 for fray forge and $15.75 for Lake Superior charcoal.

Finished Material—Local mills are firm. Iron bars are in heavy demand and there is no cutting below 1.35c. Small orders for plates and shapes are numerous.

Philadelphia

July 3—The general hardening of prices in pig iron seems to be expected. Recent quotations have been withdrawn for foundry and forge though the withdrawal has not aroused the market to action. There is more activity in material for cast pipe than any other and both northern and southern makers have secured a liberal volume of business. There are prospects of some idle furnaces being blown in. Transactions in No. 2 foundry are small considering the small supplies in users hands. Low phosphorus is selling well and malleable is under good inquiry. Many consumers, however, are supplied for some time to some. No. 2 X foundry sells at $15.25 @ $15.50, gray forge $15., basic $15.50 per ton.

Steel Billets—Prices have been marked up to $24.40 and several good sized lots have been taken at figure; stocks among consumers are low.

Bar Iron—Bars are active at higher prices.

Sheets—Prices have been advanced for early delivery but the orders are mostly for small quantities to piece out new requirements.

Pipes and Tubes—Prices are being maintained and there is enough business in sight to satisfy the mill interests.

Plates—All plate mills in the district are booking an abundance of business. The car building interests and all other buyers have not covered their urgent requirements and this points to a stronger situation in the sheet market.

Structural Material—Much new early fall delivery business is being ordered. The rumor that new and larger car orders are coming is making a stronger foundation for both shapes and plates.

Scrap—The market is again active in small lots, mostly from small buyers picking out material to fill out current orders.

Pittsburgh

July 1—Iron and steel exports made a new record in May, totaling 307,656 gross tons, a gain of 15 per cent. over April. Exports during April and May averaged a rate of 3,450,000 tons a year, 58 per cent. in excess of the 1911 total and more than double the rate in 1910. Rail exports in May were the heaviest for any month on record, 60,306 tons, but gains were well distributed among other items.

The local iron and steel market presents a quiet aspect this week, following last week's advances in certain finished-steel products and this is true of pig iron as well as of finished steel. The Connellsville coke operators have not succeeded yet in inducing furnaces not covered for second half to enter into contracts at the price of $2.50, but they have adopted fresh tactics, by blowing out a proportion of ovens, in order to force the spot market above the asking price on contracts. In this they seem to have been successful, sales being reported of 50 to 60 cars of prompt coke at $2.50 at ovens.

At last week's advances, bars 1.25c. and plates and shapes 1.30c., these commodities are $4 a ton above their low point last November, when the low point of April, 1909, was touched but not passed. Hoops are quotable at 1.30c. on very desirable contracts and at 1.35c. ordinary business. Standard railroad spikes are firm at 1.50c. and small spikes at 1.60c., all these products having lately advanced $1 a ton.

Mills are closing a minimum amount for repairs, but several are off this week. In the case of sheet and tin mills the labor supply is so scant that plants are to be kept running, only a few mills being taken off at a time for repairs.

Pig Iron—The market is quiet but strong. On account of the uncertainty as to coke prices some furnaces are pursuing a conservative policy. Buyers are not keen, as they are covered for third quarter and it is too early, in the present temper of the market, to consider fourth quarter. The Andrews & Hitchcock Iron Co. will blow in its second stack at Hubbard at the close of this week. We continue to quote: Bessemer, $14.25; basic, $13.25; No. 2 foundry, $13.25@13.50; forge, $13; malleable, $13@13.25, all f.o.b. valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market is quieter as consumers are getting fair deliveries on contract. It is now only on the most prompt delivery that a premium must be paid over the regular price, which can be done for shipment over a couple of months as well as over the balance of the year. We quote small prompt lots at $50@52 and contracts at $48.50, f.o.b. Baltimore.

Steel—The market continues very firm, and steel is particularly scarce now, as one or two of the mills are down for repairs for a week or ten days. Prices quoted are largely nominal: Billets, $21.50; sheet bars, $22, f.o.b. maker's mill, Pittsburgh; Billets, $21@21.50; sheet bars, $22, f.o.b. maker's mill, Youngstown.

Sheets—Specifications on sheet contracts were very heavy last week, as a number of low-priced contracts were to expire with the month. The sheet market has been gaining in strength steadily for some time, and rapidly in the past fortnight. The American Sheet & Tin Plate Company on April 11 advanced its minimum prices to 1.95c. on black and $3 on galvanized, but ever since then until the past few days there has been shading by several independents, particularly on early deliveries. Such shading has now practically disappeared and the market is firm at the prices mentioned. The mills have several weeks, and in the case of a few interests several months of actual business on books, and they are thus fortified for a dull summer. The independent sheet and tin mills which operate under union auspices, about half the total independents, on Saturday afternoon arranged with the Amalgamated Association to continue the old wage scale for another twelve months. The men had

asked advances on certain jobs which were equivalent to an average advance on the entire scale of about 2% in the case of sheets and about 7% in the case of tinplates. We quote: Black sheets, 28 gage, 1.95c.; galvanized, 28 gage, 3c.; blue annealed, 10 gage, 1.40c.; painted corrugated 28 gage, 2.15c. per lb. and $1.35 per square; galvanized corrugated 28 gage, 3.05c. per lb. and $2.55 per square.

Pipe (By telegraph)—Effective July 1 the National Tube Co. advanced merchant steel pipe and oil-country goods 7-in. and larger one point, or approximately $2 per ton, and independents have followed this advance. June 1 there was an advance of one point on 6-in. and under, so that all sizes have now advanced one point. Specifications were very heavy in June and all pipe mills are well filled.

St. Louis

July 1—The summer lull has set in and the demand for pig iron is rather light, though considering the season entirely satisfactory. The price of $11.25 Birmingham or $15 St. Louis for immediate delivery holds for No. 2 foundry. A premium of 25c. per ton is asked for last-quarter delivery. The demand is mostly for small lots for present delivery. Finished products and railway supplies are in very good demand. Northern Iron is in light demand at $14.50 per ton.

Iron Ore Trade

Exports and imports of iron and manganese ore in the United States five months ended May 31, long tons:

	1911	1912	Changes
Iron ore, imp.....	683,572	814,364	I. 130,792
Iron ore, exp.....	52,104	103,368	I. 51,262
Manganese, imp.....	64,623	95,836	I. 31,213

Iron ore imports this year included 48,695 tons from Spain, 25,040 from Newfoundland, 177,741 from Sweden and 549,070 from Cuba.

Sault Ste. Marie Canal Traffic

The freight passing through the Sault Ste. Marie Canal in May was 8,936,693 tons, the largest ever reported in May. For the season to June 1 the total freight was, in short tons:

	1911	1912	Changes
East-bound.....	4,531,433	7,128,152	I. 2,596,719
West-bound.....	2,386,172	1,975,459	D. 410,713
Total.....	6,917,605	9,103,611	I. 2,186,006

The number of vessel passages this year was 3379, showing an average cargo of 2694 tons. The mineral freights included in the totals were, in short tons except salt, which is given in barrels:

	1911	1912	Changes
Coal.....	2,059,146	1,670,870	D. 388,276
Iron ore.....	3,589,120	5,546,715	I. 1,957,595
Pig and mfd. iron.	84,605	113,807	I. 29,202
Copper.....	21,405	19,785	D. 620
Building stone.....	612	2,282	I. 1,670
Salt, bbl.....	175,815	219,022	I. 43,207

Iron ore was 60.9% of the total freight, and coal 18.4% this year.

Metal Markets

New York, July 2—The metal markets have been less active, and price changes small.

Our market report this week covers the period from Thursday, June 27 to Tuesday July 2. Next week the usual weekly period will be resumed.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
May 1912..	$ 4,450,899	$ 3,346,491	Exp. $1,404,408
" 1911..	6,817,149	5,014,741	Exp. 1,802,409
Year 1912..	26,225,801	19,653,285	Exp. 6,572,516
" 1911..	10,176,807	29,005,312	Imp. 18,828,505
Silver			
May 1912..	6,725,781	4,345,032	Exp. 2,380,749
" 1911..	5,054,304	3,555,842	Exp. 1,498,462
Year 1912..	28,623,028	20,384,764	Exp. 8,238,264
" 1911..	28,665,500	18,454,155	Exp. 10,211,345

Exports from the port of New York, week ended June 29: Gold, $4,977,131, chiefly to France and Mexico; silver, $1,369,603, principally to London and Paris. Imports: Gold, $1,475,352, largely from France and Mexico; silver, $55,907, from South America and Japan.

Gold—The price of gold on the open market in London remains at the bank level 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. Supplies were distributed, parcels being taken for Germany, Turkey, India and Java. In New York an additional $2,000,000 was taken for export to Paris.

Platinum—The jewelers are beginning to take a little for the fall trade. Prices are firm and unchanged. Dealers ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal. The foreign market seems to be a little unsettled.

Iridium—The price of this metal is easier at $63 per oz. New York.

Silver—The market has ruled quiet and dull with lower tendency, and closes at 28⅛d. in London, ¼d. fall for the week. The market is quoted weak at the close on speculative selling based on an increase in the Indian Currency reserve of 1¾ crores of rupees.

SILVER AND STERLING EXCHANGE

June July	27	28	29	1	2	3
New York....	61⅛	61⅛	61¼	61¼	61⅛	....
London.....	28⅜	28⅛	28⅛	28⅛	28⅛	....
Sterling Ex..	4.8725	4.8710	4.8715	4.8715	4.8725	....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver. 0.925 fine.

Exports of silver from London to the East, Jan. 1 to June 20, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.....	£4,008,700	£3,270,300	D. £ 738,400
China.....	822,800	873,500	I. 50,700
Total.....	£4,831,500	£4,143,800	D. £ 687,700

India Council bills in London averaged 16.05d. per rupee for the week.

It is reported from Ottawa that the Canadian mint will turn out this year about $8,000,000 in $5 and $10 gold pieces. The plan to coin Canadian silver dollars has been abandoned. All the silver minted will be in subsidiary coins. The first of the gold pieces have been sent to British Columbia.

Copper, Tin, Lead and Zinc

NEW YORK

June-July	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
27	17¾ @17¾	17.25 @17.35	45¼	4.50	4.40 @4.42½	6.95 @7.05	6.80 @6.90
28	17¾ @17¾	17.25 @17.35	45¼	4.50	4.40 @4.42½	6.95 @7.05	6.80 @6.90
29	17¾ @17¾	17.25 @17.35	45¼	4.50	4.40 @4.42½	6.95 @7.05	6.80 @6.90
1	17¾ @17¾	17.25 @17.35	45¼	4.50	4.42½ @4.45	6.90 @7.00	6.75 @6.85
2	17¾ @17¾	17.25 @17.35	45¼	4.50	4.42½ @4.45	6.90 @7.00	6.75 @6.85
3	.....	.....	....	....	.....	.....	.....

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

June-July	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
27	78 5/16	79⅛	83¾	209	201	18	25¾
28	77⅛	78⅜	83	209	203¾	18 1/16	25¾
29	.....	.....	.....	.....	.....	.....	.....
1	77⅜	78⅛	83⅛	209	203¾	18⅛	26
2	76¾	77⅜	82⅛	207½	203	18⅛	26
3	....	....	....	....	....	....	....

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ±£25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

Copper—The week of June 27-July 2 has been very quiet, almost stagnant. The large consumers are pretty well supplied for the present and some of them seem to have been frightened by the sudden drop of standard in London last week. At any rate they have been out of the market. The leading agencies have maintained their price of 17¾, usual terms, but have done practically no busi-

ness. The small demand has been satisfied from second hands, who have supplied it generally at 17½, delivered 30 days. The coming holiday has also had some effect on the market and there will be little business until it is over.

Lake copper has been almost entirely nominal, sales being few and far between. On the other hand, producers are not pressing sales. In consequence, the market is in second hands and quite nominal at the last prices: 17⅜@17⅝c. for Lake copper and 17.25@17.35c. for electrolytic in cakes, wirebars or ingots. Casting copper is quoted nominally at 17@17⅛c. as an average for the week.

The London market for standard copper has been quiet and weakish. On June 27, spot copper was quoted £78 6s. 3d.; on June 28 it was about 15s. lower, and on July 2, spot closes at £76 15s., and three months at £77 12s. 6d. per ton.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 7586 long tons. Our special correspondent reports the exports from Baltimore at 1401 tons.

Visible stock of copper in Europe June 30 are reported as follows: Great Britain, 28,640; France, 5490; Rotterdam, 1350; Hamburg, 5190; afloat from Chile, 1480; afloat from Australia, 6,000; total, 48,150 long tons, or 108,186,000 lb.; a decrease of 1930 tons from the June 13 report.

Tin—The market has been firm, and the feature of the past few days has been the advance in three months' tin, which, on June 27, was £201, or £2 above the previous day, spot ruling at £209. On June 28, three months' advanced further £2 15s., and held its advance during first, closing on July 2 at 15s. lower, or £203 per ton.

There was no squeeze on this side the end of June, as had been expected in some quarters. It appears that consumers have helped themselves through by making inroads on their stocks, and while tin for the first half of July is still comparatively short, after that the shipments that have been made from the Continent will relieve the situation. The premium on spot tin, as compared with shipment tin, has become considerably lower, being about 1¾c. The spot market has ruled around 47¼@47½c. July tin has been about 46⅛c., while tin for shipment has been 45¼@45⅝c., closing at 45¼ cents.

Visible stocks of tin on June 30 are reported as follows: London, 7750; Holland, 578; United States, excluding Pacific ports, 4177; total, 12,445 long tons; a decrease of 1900 tons from the May 31 report.

Lead—The market is firmer. Consumption of white lead is excellent and other branches are also doing well. St. Louis is quoted 4.42½@4.45c. and New York 4.50 cents.

The London market is again higher and there is a great scarcity of lead for early delivery. Spanish lead is quoted £18 12s. 6d. and English lead 2s. 6d. higher.

The National Lead Co. has acquired control of the Matheson Lead Co., a large manufacturer of white lead, by purchase of stock. This appears to have been a fair business transaction. Both companies were in need of enlarged plants and the Matheson Co. owns property which was well situated and adapted for a larger plant. The National Lead Co. owned no such property, but was considering the purchase of land for that purpose, which is now rendered unnecessary. White lead has been exceedingly active recently and the demand has been larger than for some time.

Spelter—A good business is being done from day to day at about last prices, and the market is quoted 6.75@6.85c., St. Louis; 6.90@7c., New York.

The European market is firmer, good ordinaries being quoted £26 and specials £26 5s. per ton.

Base price of zinc sheets is $8.65 per 100 lb., f.o.b. La Salle, Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Other Metals

Aluminum—New business is good. The consumption appears to be large and it is reported that the chief producer is rather behind on its contract deliveries. The price is firm at 23c. per lb. for No. 1 ingots, New York. The foreign market is steady.

Antimony—Business is better and there have been fair sales, but no great activity. An improvement is expected as this is the antimony season. Prices are a little firmer. Cookson's is held at 8@8.25c. per lb. and Hallett's at 7.75@8c.; while 7.15@7.50c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—There is a little more activity in this metal and an advance of 5s. in London has been followed by a small advance here. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and $39.50 for export. The London rice is now £8 10s. per flask, with £8 7s. 6d. asked from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Zinc and Lead Ore Markets

Platteville, Wis., June 29—The base paid this week for 60% zinc ore was $55. The base price for 80% lead ore was $54 per ton.

SHIPMENTS, WEEK ENDED JUNE 29

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Shullsburg	874,040	.....	.....
Mineral Point	842,740	.....	.....
Dodgeville	624,000	.....	.....
Benton	568,300	390,000	599,100
Platteville	567,100	.....	246,800
Harker	444,050	.....	.....
Hazel Green	357,600	.....	.....
Galena	340,100	.....	.....
Rewey	131,000	.....	.....
Highland	95,600	.....	.....
Cuba City	82,680	83,000	.....
Montfort	66,000	.....	.....
Total	4,993,210	473,000	845,900
Year to date	104,115,470	4,496,470	14,833,370

Shipped during week to separating plants, 2,407,870 lb. zinc ore.

Joplin, Mo., June 29—The high price of zinc sulphide ore this week was $61, the base per ton of 60% zinc is $52@58. Zinc silicate sold at $29@31 per ton of 40% zinc. The average price, all grades, was $53.90 per ton.

SHIPMENTS, WEEK ENDED JUNE 29

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,490,390	.....	963,400	$153,186
Joplin	1,932,570	.....	172,310	59,901
Galena	644,560	.....	99,960	20,745
Duenweg	696,980	.....	25,260	20,222
Alba-Neck	454,910	.....	78,490	15,488
Miami	246,710	.....	292,680	13,821
Oronogo	508,370	.....	.....	13,098
Granby	187,150	505,210	13,740	12,100
Spurgeon	117,850	269,700	23,040	8,101
Jackson	261,720	.....	8,300	7,290
Carl Junction	240,600	.....	.....	7,097
Springfield	170,500	.....	.....	5,100
Cave Springs	62,730	.....	.....	1,693
Sarcoxie	58,640	.....	.....	1,583
Carthage	48,110	.....	.....	1,298
Lawton	38,300	.....	.....	1,072
Aurora	.....	66,400	.....	996
Totals	10,130,090	841,310	1,677,180	$342,791
6 mos	263,214,860	16,082,740	44,684,190	$8,083,248

Blende val., the week, $282,219; 6 mos., $6,626,595
Calamine, the week, 13,495; 6 mos., 238,287
Lead value, the week, 47,077; 6 mos., 1,218,366

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43 31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55 88	38.18	54.38	56.49	55.01
July	40.75	.....	38.36	.....	58.81	.....
August	42.50	.....	41.28	.....	60.74	.....
September	42.63	.....	41.29	.....	59.33	.....
October	42.38	.....	40.89	.....	54.72	.....
November	45.40	.....	43.25	.....	57.19	.....
December	44.13	.....	40.76	.....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

The ore market this week shows the same prices as were paid last week, but the second- or middle-grade ores were more in demand. The production was much improved this week, as most of the mines have recovered from the flooded condition of two weeks ago.

The lead market was strong at $58; average, all grades, $56.12 per ton.

Chemicals

New York, July 2—This is a holiday week and there is very little doing in the general market.

Arsenic—Supplies are a little better. Canadian makers are catching up to their contracts and a shipment of 25 tons was received from Mexico July 1. Trade is still fair and prices unchanged. Spot arsenic is $3.75 per 100 lb. while $3.62½ is asked for futures.

Copper Sulphate—The market is quiet but steady. Quotations are unchanged at $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is fair and prices firm, 2.45c. per lb. being asked for both spot and futures.

CURRENT WHOLESALE PRICES

Ammonium sulphate .....cwt.	3.25@3.28
Arsenic, white.....lb.	0.03¼@0.03¾
Barytes, ground .....sh. ton	12.50@14.00
" floated. .....sh. ton	16.00@17.00
Calcium acetate, gray .....cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls. . . .sh. ton	70.00
Carbons, good drill quality. . . . carat	75.00@85.00
Cement, Port., Am. . . . . 400-lb. bbl.	1.33
Chrome brick, f.o.b., Pittsburg. . . M.	175.00
ore, 50%, ex-ship, N. Y., lg. ton	14.00@16.00
Copperas, bulk. .....cwt.	0.55
bbl. .....cwt.	0.70@0.85
Copper sulphate. .....cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburg. ton	8.00@9.00
Magnesite, crude, 95%. . . .lg. ton	9.00@11.00
calcined, powdered.....	30.00@35.00
brick, dom., f.o.b. Pittsburg. .....M.	160@180
Paints, litharge, Am. powd.....lb.	0.05½@0.06¼
red lead, American.....lb.	0.06¼@0.07¼
white lead, Am., dry.....lb.	0.05¼@0.06
zinc white, Am., dry.....lb.	0.05¼@0.06¼
Phosphates, acid:	
*Fla., hard rock 77%.....	5.75@6.25
land pebble 68%.....	3.70@3.80
†Tenn., 78@80%.....	5.00@5.50
75%.....	4.75@5.00
68@72%.....	4.25@4.50
†So. Car. land rock 60%.....	3.50@3.75
Potassium cyanide, 98@99%....lb.	0. 19
Pyrite:	
Domestic, non-arsenical, furnace size, f.o.b. R.R. per unit.....	0.12@0.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines.....	0.11½@0.12
Imported, non-arsenical, furnace size, ex-ship, per unit.....	0.13½
Imported, arsenical, furnace size, ex-ship, per unit.....	0.12½@0.13
Imported, fines, arsenical, ex-ship.	0.11@0.12
Imported, fines non-arsenical, ex-ship, per unit.....	0.12½

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

Sodium cyanide, 120 to 130% KCN (per 100%).....lb.	0.18
nitrate 95% spot. .....cwt.	2.45
95% future. . . .cwt.	2.45
Sulphur, Louisiana prime, N. Y, lg. ton	22.00@22.50
roll. .....cwt.	1.85@2.15
flour. .....cwt.	2.00@2.40
flowers, sublimed.....cwt.	2.20@2.60
pow. com., bags.....cwt.	1.50
Sicilian, crude brimstone lg. ton	22.50
Zinc chloride, granular.....lb.	0.04½@0.04½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. †On vessel Ashley River, S.C.

Note—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Petroleum

Oil production in California in May was 7,333,180 bbl.; deliveries, 6,703,087 bbl. Stocks reported were 44,017,775 bbl. at the close of the month.

New Caledonia Ores

Shipments of ore from New Caledonia twelve months ended March 31, as reported by the *Bulletin du Commerce*, of Noumea, included 7558 tons nickel ore and 10,032 tons chrome ore.

MINING STOCKS

New York, July 2—On June 27 the Exchange was more inclined to discuss the Baltimore convention than stocks and business was very slow. On the Curb there was quite a demand for mining stocks and small advances were recorded all around. Yukon Gold is showing some life again.

June 28—The Exchange was still dull but firm. Trading on the Curb was only moderate. Copper stocks were nearly all off a fraction, losing the gains of the preceding day; and Cobalts were also weaker. El Paso and Yukon Gold each gained a little.

June 29—Trading on the Exchange was very moderate but prices were steady. Dealings in mining stocks on the Curb were rather narrow but with some gains except in the coppers which were stationary.

July 1—The Exchange was again dull and without special features. Trading on the Curb was narrow, but prices were firm, and some mining stocks advanced. On July 2 there was little change in conditions.

Boston, July 1—Copper shares have had a reactionary week and along with this the market has been quiet except in the cases of some specialties. Mohawk took a sharp $4.50 advance to $73, on an announcement that a $3 dividend had been declared. This was unfounded, for the following day the directors declared a $2.50 semi-annual dividend. In the meantime the price of Mohawk drifted back to $70.75. This dividend compares with $1 six months ago and 75c. a year ago.

The increasing of the Mohawk dividend adds another copper-mining company to the list that have increased their dividends payments the current year to date. There is some disappointment that the Anaconda Co. did not increase from the 50c. quarterly rate, but it is felt that this may come with the next declaration.

Butte & Superior suffered a $6 decline to $42.50 on liquidation and belief that the apex question will again be brought into the courts by Senator Clark, who owns adjoining property. From this

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	March	April	May
Alaska shipments.	4,987,916	1,243,911	1,720,391
Anaconda.....	25,900,000	25,480,000	25,800,000
Arizona, Ltd.....	3,150,000	3,400,000	3,500,000
Copper Queen.....	7,197,121	6,806,425	7,024,087
Calumet & Ariz....	4,652,000	4,104,000	4,424,000
Chino.....	1,108,381	1,150,000	1,275,850
Detroit.....	2,246,238	2,506,718	2,092,478
East Butte.....	1,480,000	1,400,000	.....
Mammoth.....	1,939,310	1,718,450	.....
Mason Valley.....	1,140,000	1,503,056	1,520,000
Nevada Con.....	6,380,000	6,115,095	6,063,462
Ohio.....	599,156	675,000	.....
Old Dominion.....	2,432,000	2,167,000	.....
Ray.....	2,300,000	2,611,920	2,924,913
Shannon.....	1,388,000	1,544,000	1,464,000
South Utah.....	299,000	284,215	236,884
United Verde*.....	2,250,000	2,250,000	2,500,000
Utah Copper Co....	8,160,000	8,615,775	9,564,919
Lake Superior*....	19,750,000	18,250,000	21,250,000
Non-rep. mines*...	6,792,463	7,625,000	8,400,000
Total production.	104,051,585	97,400,495	.....
Imports, bars, etc..	23,519,215	26,842,014	.....
Total blister.....	127,570,800	124,242,509	.....
Imp. in ore & matte	8,736,874	9,350,972	.....
Total American..	136,307,674	133,593,481	.....
Miami†.....	2,755,000	2,554,352	2,565,000
Brit. Col. Cos.:			
British Col. Copper	.....	1,043,173	875,000
Granby	1,882,073	1,941,797	1,914,460
Mexican Cos.:			
Boleo†.....	2,424,800	2,149,280	2,260,160
Cananea	2,834,000	4,654,000	4,600,000
Moctezuma	2,446,731	2,797,718	2,892,521
Other Foreign:			
Cape Cop., S. Africa	725,760	954,240	754,880
Kyshtim, Russia...	.....	1,545,000	.....
Spassky, Russia....	638,400	649,600	694,400
Famatina, Argen..	.....	.....	.....
Tilt Cove, Newf'd..	104,992	119,869	123,087
Exports from:			
Chile.....	3,584,000	6,496,000	3,696,000
Australia.....	8,064,000	9,408,000	7,840,000
Arrivals in Europe‡	12,559,680	12,064,640	9,976,860

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VI, 1911..	124,554,312	61,655,561	71,460,519
VII.....	112,167,934	56,982,582	74,880,658
VIII.....	125,493,667	59,935,364	69,855,660
IX.....	115,588,950	57,311,584	50,824,011
X.....	118,255,442	64,068,307	60,084,349
XI.....	111,876,601	68,039,776	67,049,279
XII.....	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912.....	119,337,753	62,343,901	80,167,904
II.....	116,035,809	56,228,368	63,148,096
III.....	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V.....	126,737,836	72,702,277	69,485,945
VI	.....	.....	.....

VISIBLE STOCKS

	United States	Europe	Total
VII, 1911.....	157,434,164	195,932,800	353,366,964
VIII.....	137,738,858	191,891,840	329,630,698
IX.....	133,441,501	191,228,800	324,670,301
X.....	140,894,856	191,945,600	332,840,456
XI.....	134,997,642	176,825,600	311,823,242
XII.....	111,785,188	164,281,600	276,066,788
I, 1912.....	89,454,695	158,323,200	247,777,895
II.....	66,280,643	154,851,200	221,131,843
III.....	62,939,988	141,142,400	204,082,388
IV.....	62,367,557	136,819,200	199,186,757
V.....	65,066,029	134,176,000	199,242,029
VI.....	49,615,643	117,801,600	167,417,243
VII.....	.....	108,186,000	.....

level a recovery to $47.37½ ensued. The stock sold at $51.75 early last month.

Curb trading has shown a little more animation and strength in spots. Houghton Copper rose to $9.75, but reacted over $1. Ohio Copper has been very active, breaking to 50c. per share.

Assessments

Company	Delinq	Sale	Amt
Best & Belcher, Nev	June 3	June 27	$0.10
Buffalo, Mont.	June 4	July 2	0.002
Challange, Nev.	June 8	July 2	0.10
Chollar, Nev.	July 7	Aug. 5	0.10
Confidence, Nev.	July 15	Aug. 9	0.20½
Crown Point, Nev.	June 24	July 17	0.10
Exchequer, Nev.	May 23	June 13	0.05
Glen Dale, Utah	May 25	June 25	0.00
Gould & Curry, Nev.	July 19	Aug. 12	0.05
Great Falls, Utah	June 26	July 27	0.002½
Hale & Norcross, Nev.	July 2	July 29	0.05
Houghton Copper, Mich	May 17	.....	1.00
Julia, Nev.	May 15	June 5	0.05
Mineral Farm, Ida.	July 15	Aug. 15	0.002
Mineral Hill, Nev.	Aug. 5	Oct. 5	0.01
O. K. Silver Mining, Utah	July 15	Aug. 1	0.002½
Oreano, Ida.	July 18	Aug. 19	0.001
Overman, Nev.	June 29	July 23	0.10
Savage, Nev.	June 4	June 26	0.10
Seven Troughs, Nev.	June 15	July 2	0.002½
Sierra Nevada, Nev.	July 4	July 30	0.10
Silver Mt., Ida.	July 15	Aug. 15	0.002
Tintic Central, Utah	June 14	July 6	0.005
Union Consolidated, Nev.	July 12	Aug. 7	0.15
Utah Antimony, Utah	June 1	.....	0.03
Utah, Nev.	July 12	Aug. 6	0.05
Yankee Con., Utah	.....	.....	0.02
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.088
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	.....	25.034	24.286	.....
August	52.912	52.171	.....	24.428	24.082	.....
September	53.295	52.440	.....	24.567	24.209	.....
October	55.490	53.340	.....	25.596	24.594	.....
November	55.635	55.719	.....	25.680	25.649	.....
December	54.428	54.905	.....	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	.....	12.720	.....	56.673	.....
August	12.405	.....	12.634	.....	56.266	.....
September	12.201	.....	12.508	.....	55.253	.....
October	12.189	.....	12.370	.....	55.170	.....
November	12.616	.....	12.769	.....	57.253	.....
December	13.552	.....	13.768	.....	62.068	.....
Year	12.376	.....	12.634	.....	55.973	.....

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	.....
February	41.614	42.962	August	43.319	.....
March	40.157	42.577	September	39.755	.....
April	42.185	43.923	October	41.185	.....
May	43.115	46.053	November	43.125	.....
June	44.606	45.815	December	44.655	.....
			Av. Year	42.281	.....

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	.....	4.397	.....	13.530	.....
August	4.500	.....	4.406	.....	14.260	.....
September	4.485	.....	4.356	.....	14.744	.....
October	4.265	.....	4.139	.....	15.332	.....
November	4.298	.....	4.181	.....	15.821	.....
December	4.450	.....	4.332	.....	15.648	.....
Year	4.420	.....	4.286	.....	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	.....	5.545	.....	25.006	.....
August	5.953	.....	5.803	.....	26.801	.....
September	5.869	.....	5.719	.....	27.750	.....
October	6.102	.....	5.951	.....	27.256	.....
November	6.380	.....	6.223	.....	26.795	.....
December	6.301	.....	6.151	.....	26.849	.....
Year	5.758	.....	5.608	.....	25.281	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	.....	14.03	.....	14.53	.....
August	15.90	.....	14.00	.....	14.47	.....
September	15.90	.....	13.57	.....	14.40	.....
October	15.43	.....	13.44	.....	14.34	.....
November	14.92	.....	13.30	.....	14.25	.....
December	15.15	.....	13.10	.....	13.90	.....
Year	$15.72	.....	$13.94	.....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS July 1

Name of Comp.	Bid.
Acacia	.05½
Cripple Cr'k Con.	.01½
C. K. & N.	.17
Doctor Jack Pot	.06½
Elkton Con.	.64½
El Paso	.98½
Findlay	.05
Gold Dollar	.17½
Gold Sovereign	.02
Isabella	.12
Jack Pot	.04½
Jennie Sample	.04½
Lexington	‡.02
Moon Anchor	.01
Old Gold	.03½
Mary McKinney	.70
Pharmacist	.01½
Portland	.92
Vindicator	.82
Work	.01½

SALT LAKE July 1

Name of Comp.	Bid.
Beck Tunnel	‡.09
Black Jack	‡.14½
Cedar Talisman	‡.02
Colorado Mining	.16
Columbus Con	‡.28
Crown Point	‡.02
Daly-Judge	‡5.60
Grand Central	‡.65
Iron Blossom	1.30
Little Bell	‡.41
Lower Mammoth	‡.02½
Mason Valley	‡11.50
May Day	‡.10
Nevada Hills	‡1.95
New York	‡.04½
Prince Con	‡1.62½
Silver King Coal'n	‡2.50
Sioux Con.	.06
Uncle Sam	.21
Yankee	‡.10

TORONTO July 1

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	‡7.10	Hollinger	13.90
Hudson Bay	‡70.00	Imperial	‡.02
Temiskaming	‡.41	Pearl Lake	.26
Wettlaufer-Lor.	‡.66	Porcu. Gold	‡.36
Apex	.03½	Porcu. Tisdale	.02
Central	‡5.56	Preston E. D.	.04½
Crown Chartered	.13½	Rea	.35
Dobie	‡.25	Standard	.01½
Dome Exten.	.26½	Swastika	.12
Foley O'Brien	.18	West Dome	.15

SAN FRANCISCO July 1

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	9.90
Belcher	.67	Jim Butler	.61
Best & Belcher	.11	MacNamara	.22
Caledonia	.88	Midway	.50
Challenge Con	.12	Mont.-Tonopah	2.55
Chollar	.02	North Star	.17
Confidence	.39	West End Con.	1.70
Con. Virginia	.50	Atlanta	.23
Crown Point	.45	Booth	.08
Gould & Curry	.02	C.O.D. Con.	.10
Hale & Norcross	.15	Comb. Frac.	.15
Mexican	2.75	Jumbo Extension	.27
Occidental	.50	Pitts.-Silver Peak	1.05
Ophir	1.05	Silver Pick	.12
Overman	.68	St. Ives	.33
Potosi	.02	Tramp Con.	‡.01
Savage	.13	Argonaut	‡2.00
Sierra Nevada	.11	Bunker Hill	‡4.50
Union Con.	.54	Cent. Eureka	.53
Yellow Jacket	.35	So. Eureka	2.90

N. Y. EXCH. July 1

Name of Comp.	Clg.
Amalgamated	85⅝
Am. Agri. Chem.	61⅜
Am.Sm.&Ref.,com	86
Am. Sm. & Ref., pf.	107⅞
Am. Sm. Sec., pf. B	87¾
Anaconda	43⅝
Batopilas Min.	1⅜
BethlehemSteelpf	71⅛
Chino	33¾
Comstock Tunnel	.12
Federal M. & S., pf.	42
Goldfield Con.	4
GreatNor.,ore,ctf.	42½
Guggen. Exp.	60⅛
Homestake	94
Inspiration Con.	19⅛
Miami Copper	28¾
Nat'nalLead,com.	58¼
National Lead, pf.	107⅛
Nev. Consol.	22
Pittsburg Coal, pf.	91⅛
Ray Con.	22⅛
RepublicI&S,com.	27⅛
Republic I & S, pf.	86
SlossSheffi'd,com.	57
Sloss Sheffield, pf.	100
Tennessee Copper	44
Utah Copper	63⅛
U. S. Steel, com	71⅜
U. S. Steel, pf.	112
Va. Car. Chem.	48¾

N. Y. CURB July 1

Name of Comp.	Clg.
Barnes King	‡.30
Beaver Con.	.46
Braden Copper	7⅛
B. C. Copper	5⅞
Buffalo Mines	‡1.40
Caledonia	.40
Con. Ariz. Sm.	⅝
Davis-Daly	2⅜
Diam'field-Daisy	9
Ely Con.	7/32
Florence	.90
Giroux	5
Gold Hill Con.	3/16
Greene Cananea	10⅜
Greenwater	.05
Internat. S. & R.	124
Kerr Lake	2⅞
Keystone	2⅜
La Rose	3⅛
McKinley-Dar-Sa.	1⅜
Min. Co. of A. new	3
Motherlode Gold.	1⅛
Nev. Utah M. & S.	03⅛
Nipissing Mines	7⅛
Ohio Copper	⅛
Pacific Sm. & M.	7/32
South Live Oak	3⅜
South Utah M. & S.	⅜
Standard Oil (Old)	865
Stand'd Oil of N.J.	380
Stand'd Oil Subs.	525
Stewart	1⅛
Tonopah	7⅛
Tonopah Ex.	1⅛
Tri-Bullion	⅛
Tularosa	‡1⅛
Union Mines	⅛
United Cop., pfd.	10
Yukon Gold	3⅞

LONDON July 2

Name of Com.	Clg.
Camp Bird	£1 8s 9d
Dolores	1 10 0
El Oro	0 16 0
Esperanza	1 10 0
Mexico Mines	7 0 0
Oroville	0 4 9
Stratton'sInd.	0 3 1½
Tomboy	1 5 0

BOSTON EXCH. July 1

Name of Comp.	Clg.
Adventure	9⅛
Ahmeek	350
Algomah	‡6½
Allouez	48
Am. Zinc	31¾
Ariz. Com., ctfs.	‡5¼
Bonanza	.45
Boston & Corbin	8¼
Butte & Balak	‡3½
Calumet & Ariz	75⅛
Calumet & Hecla	530
Centennial	25
Con. Mercur	‡.05
Copper Range	59½
Daly West	5⅜
East Butte	13⅜
Franklin	12¼
Granby	55
Hancock	34½
Hedley Gold	‡17
Helvetia	‡1¾
Indiana	19
Island Cr'k, com.	62¾
Island Cr'k, pfd.	89¾
Isle Royale	34⅜
Keweenaw	‡1¾
Lake	38¾
La Salle	7¼
Mass	‡7
Michigan	‡3
Mohawk	71
New Arcadian	4
New Idria Quick.	‡6¾
North Butte	30¾
North Lake	6½
Ojibway	5¼
Old Dominion	58
Osceola	122
Quincy	92½
Shannon	16½
Shattuck-Ariz.	22¼
Superior	46½
Superior & Bost.	2¼
Tamarack	45
Trinity	6¾
Tuolumne	3¼
U. S. Smelting	45
U. S. Smelt'g, pf.	50
Utah Apex	2⅛
Utah Con.	11½
Victoria	4
Winona	6¼
Wolverine	110
Wyandot	2⅛

BOSTON CURB July 1

Name of Comp.	Last
Bingham Mines	4½
Boston Ely	1½
Boswyocolo	.02½
Butte Central	6½
Cactus	.09
Calaveras	2½
Chief Cons	1½
Corbin	1½
Cortez	1½
Crown Reserve	3
First Nat. Cop.	2½
Majestic	.52
Mazatan	‡½
Moneta Porc.	‡.07
Nevada-Douglas	3½
New Baltic	2½
Oneco	2⅜
Raven Copper	.29
Rhode Island Coal	.26
San Antonio	‡3
S. W. Miami	‡7½
South Lake	10½
Trethewey	.40
United Verde Ext.	.30
Vulture	‡5.00

‡Last quotation.